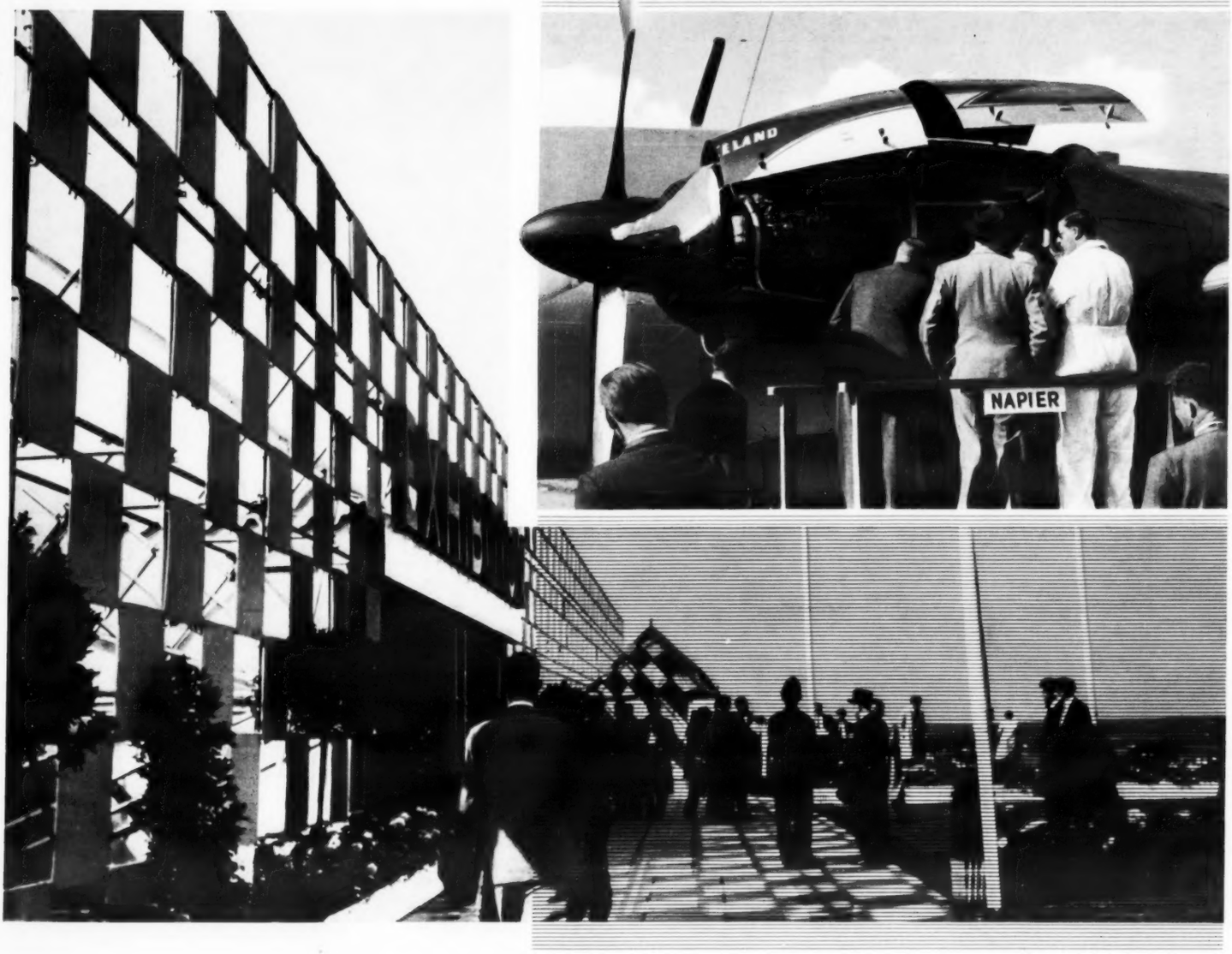
# INTERAVIA

REVIEW OF WORLD AVIATION

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IN THIS ISSUE

## Autumn Highlights

FARNBOROUGH – PARIS – DUISBURG

VOLUME IX 11 1954

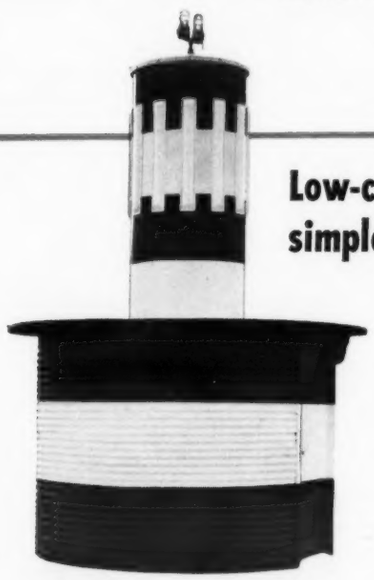
# Antenna system a major factor in Collins VOR superiority

One of the many features that make Collins' packaged VOR systems outstanding is a simplified antenna system designed for extreme accuracy. The Collins' VOR antenna produces a rotating figure-of-eight pattern directly within the antenna assembly by means of a motor driven dipole element. No goniometer is used . . . thus eliminating delicate RF adjustments which affect bearing accuracy. In addition, the RF coaxial cable interconnecting system is greatly simplified, allowing Collins' VOR to operate on new frequency assignments with minimum effort.

In conventional VOR antenna systems, the many difficult interrelated adjustments necessary are a serious source of bearing error. Collins' VOR adjustments are straightforward and simple, and can be made by personnel with minimum training.

## COLLINS 37Y-1 VOR ANTENNA

— with dust cover removed.



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*Review of World Aviation*

Volume IX | No. 11 | 1954

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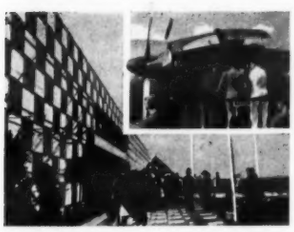

*Front cover :*

*Though fully appreciated only by the experts, the 3,000 e.h.p. Napier* ELAND *propeller turbine was probably the " hit " of this year's Farnborough Display.*


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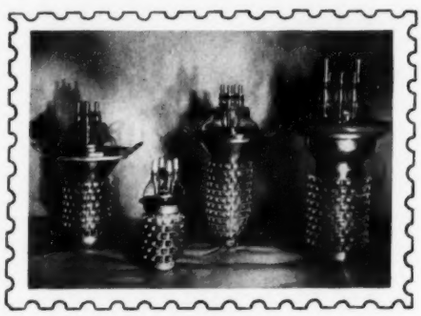

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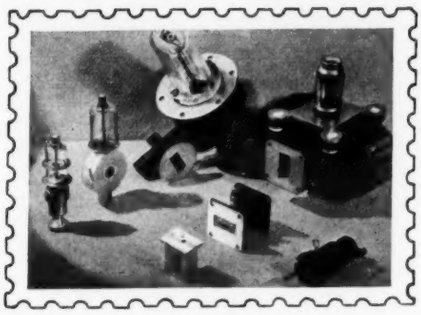

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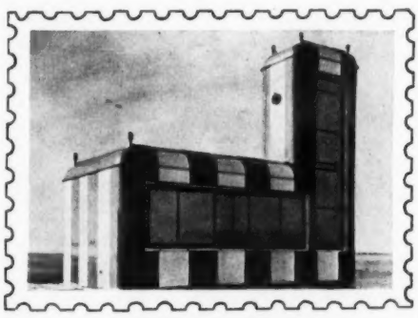

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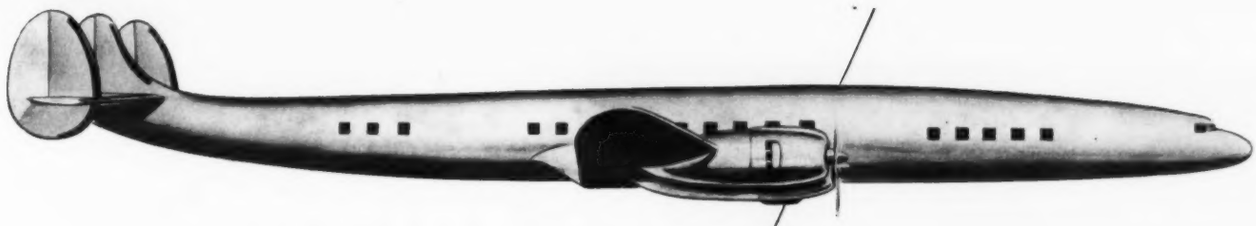

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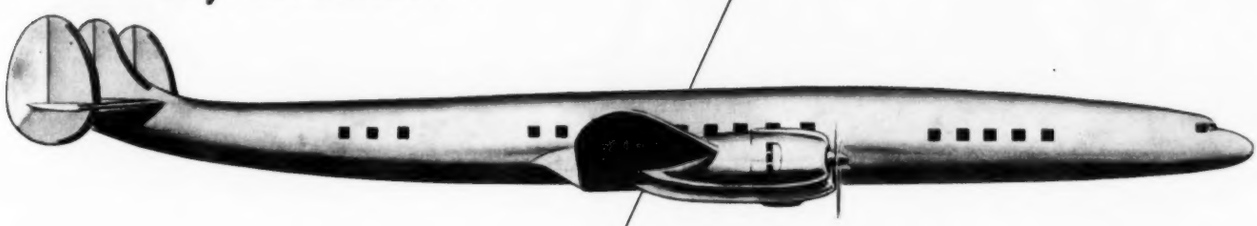

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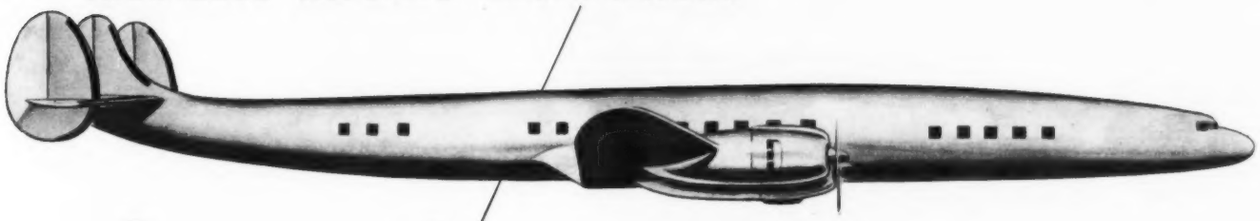

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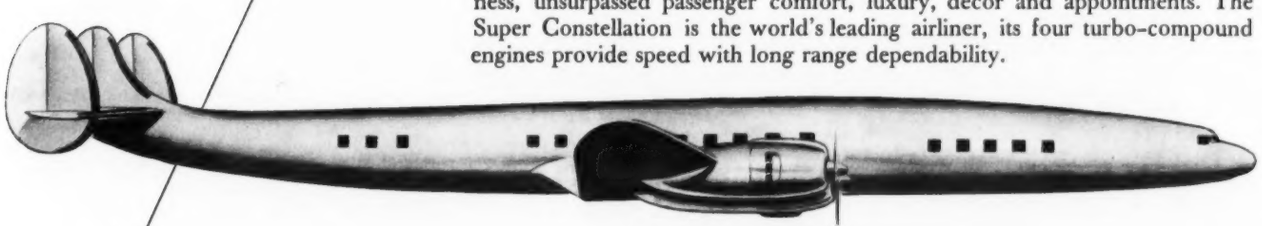

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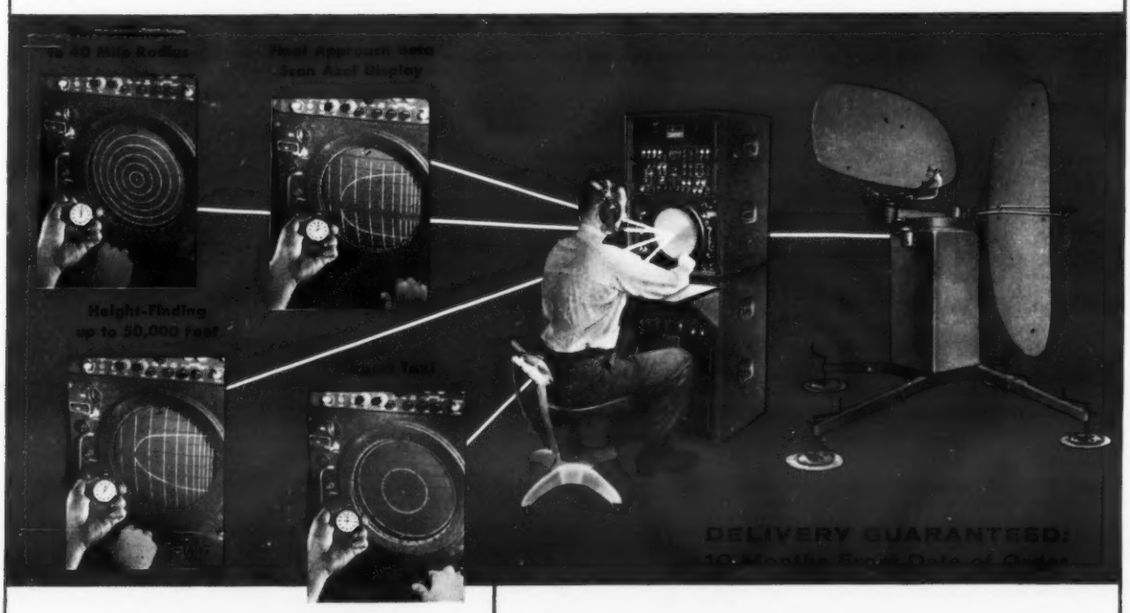


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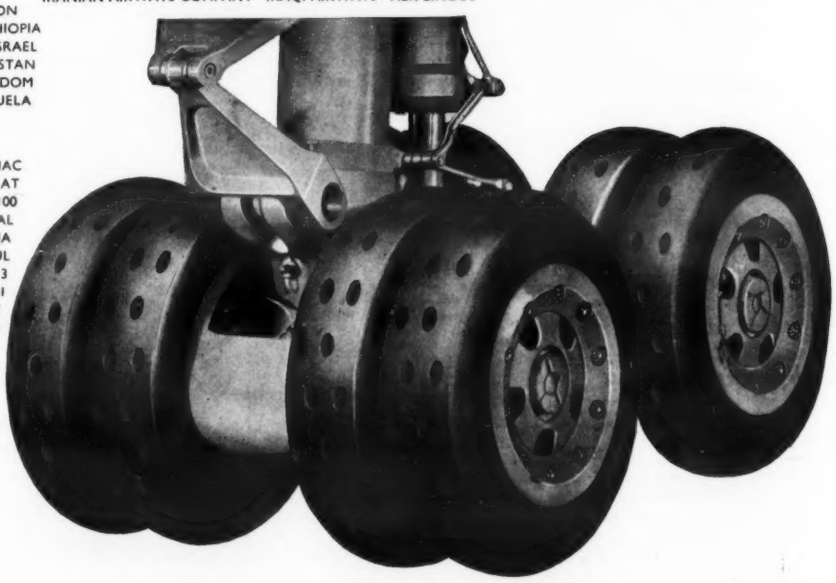

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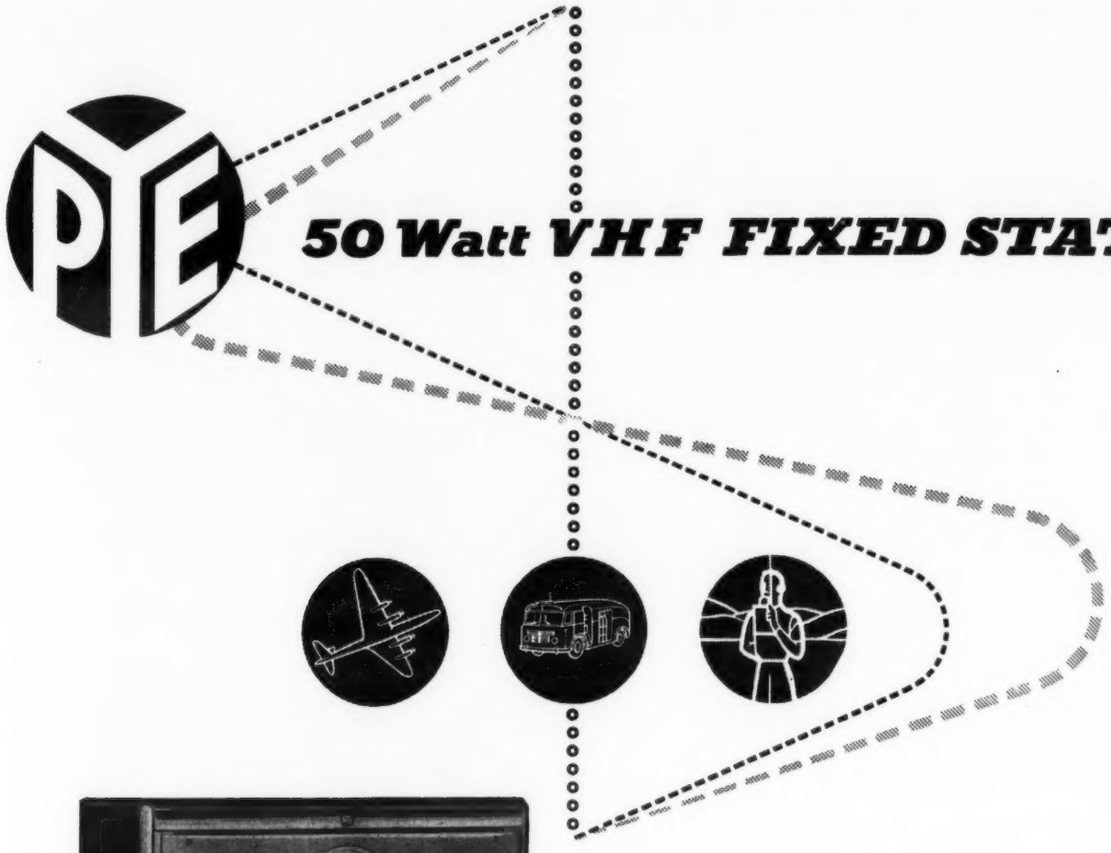

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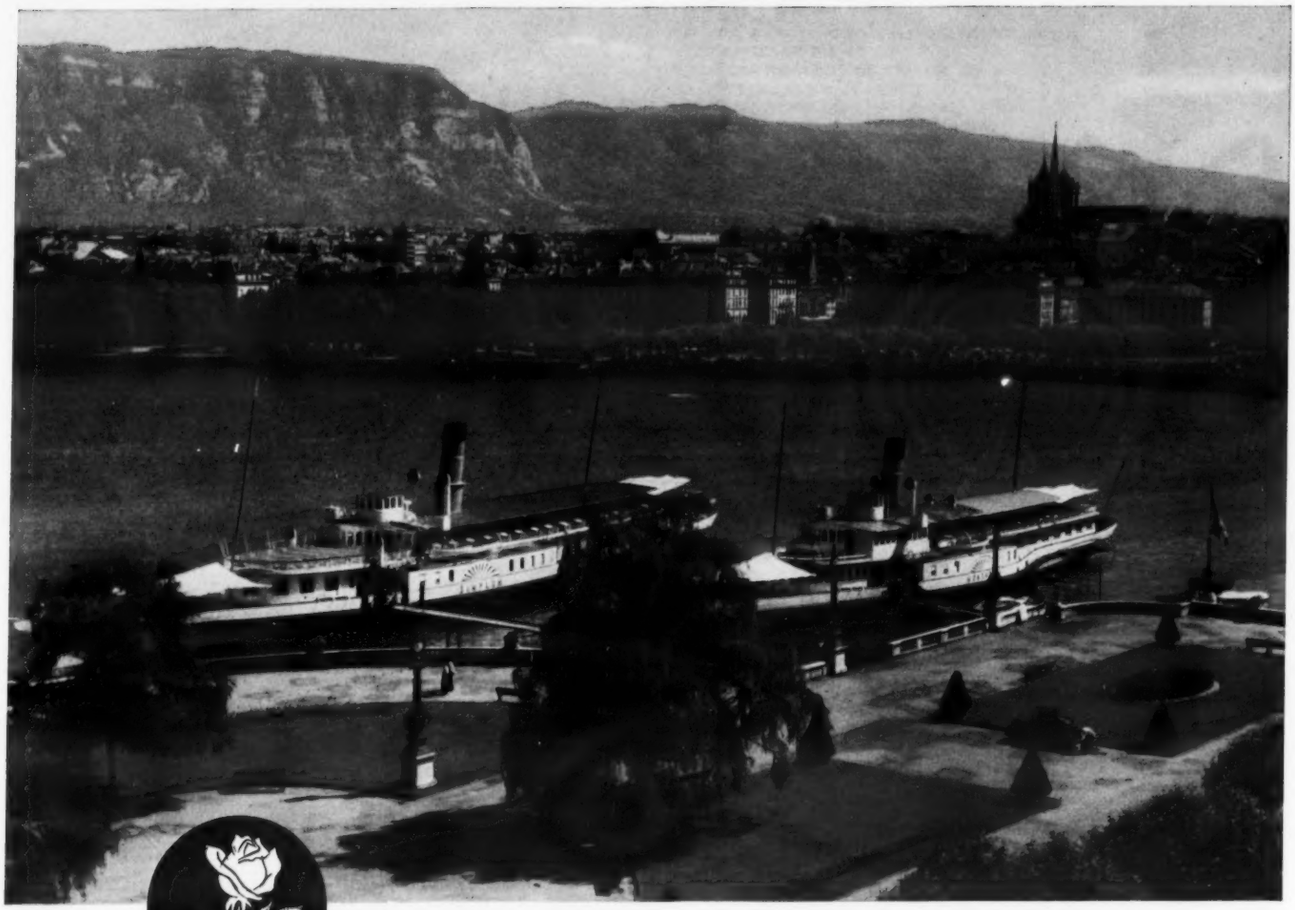

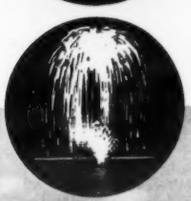

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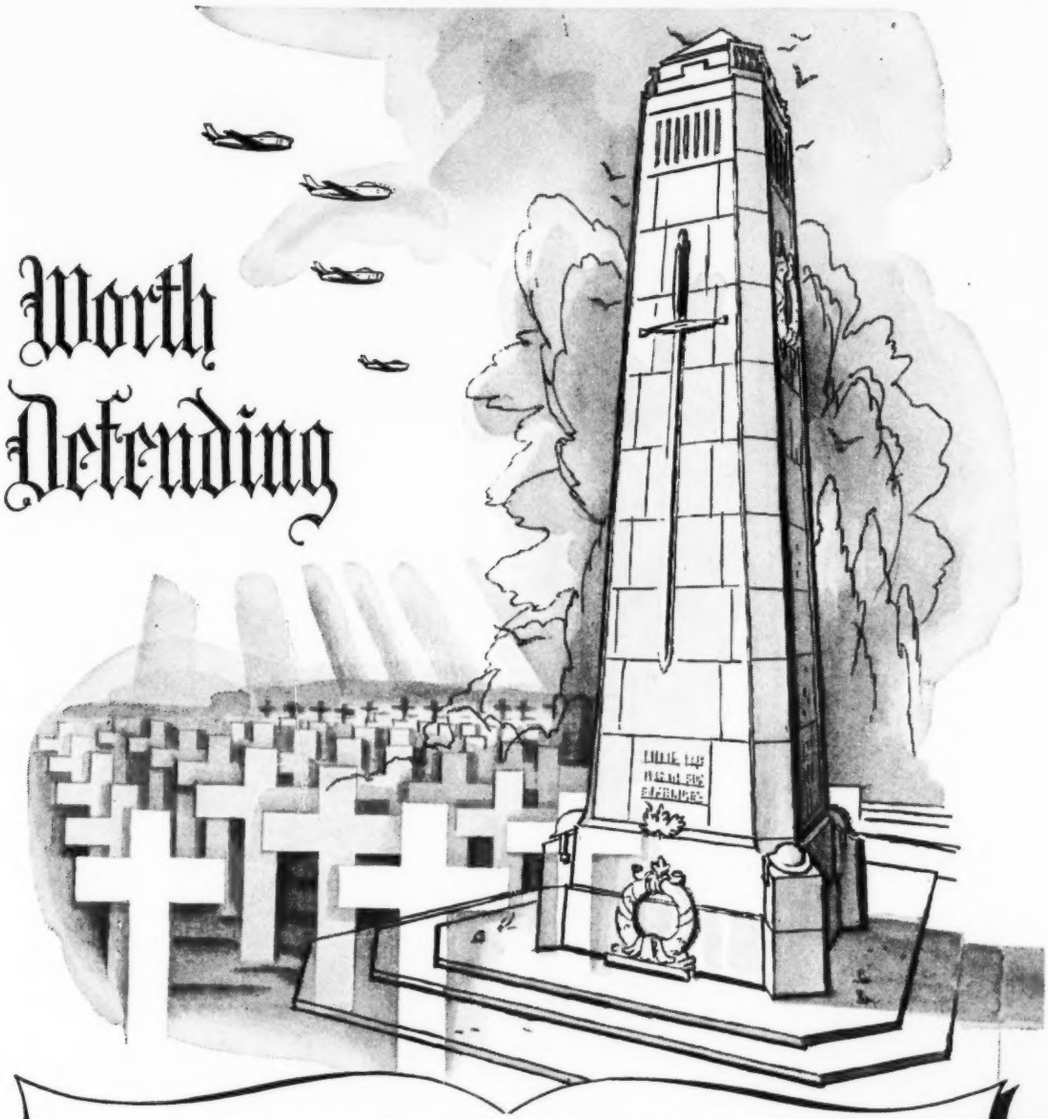
# Worth Defending



*"To you from failing hands we throw the torch,*
*Be yours to hold it high:*
*If ye break faith with us who die*
*We shall not sleep though poppies grow*
*In Flanders fields."*

And yet, when the parade is over and the last bugle note fades, it is so easy to "break faith" by being lulled into a sense of "*nothing will happen here*" . . . to let victory and freedom go by default.

"Hold high the torch" — but will we do it? We will if we respect the sacrifices of our soldiers, sailors and airmen through the great struggles in the past. Think it over in your mind . . . what they died for is worth defending *now!*

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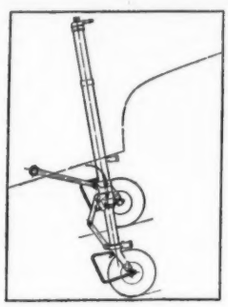
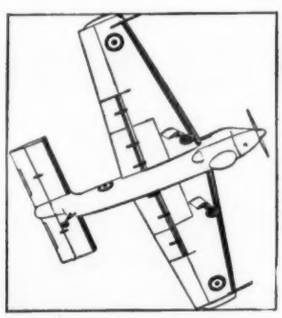
# Coastal Patrol – *Seamew* Patrol

*Because of its low landing speed, the Seamew can alight in an extremely small area. Tyre sizes can be easily changed to suit terrain.*

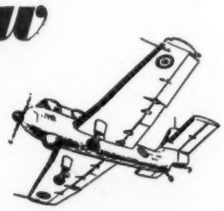


*The two position tail wheel gives the advantages of a tricycle undercarriage layout for landing, while retaining the desirable features of the normal undercarriage for take-off.*

***Seamew***—a tough, economical, all-weather submarine hunter. From an emergency coastal airstrip the Seamew can be airborne in a short distance to operate a wide-ranging patrol. It can conduct a maritime search with up-to-date radar equipment and use a variety of weapons to effect a kill. However rough-and-ready the airstrip, it can land back safely — with its low stalling and landing speeds and fixed, rugged, shock-absorbing undercarriage.



## The *Short* answer is the *Seamew*



*Generous flap surfaces contribute to the very low stalling and landing speeds. The Seamew is easy to fly and exceptionally manœuvrable.*

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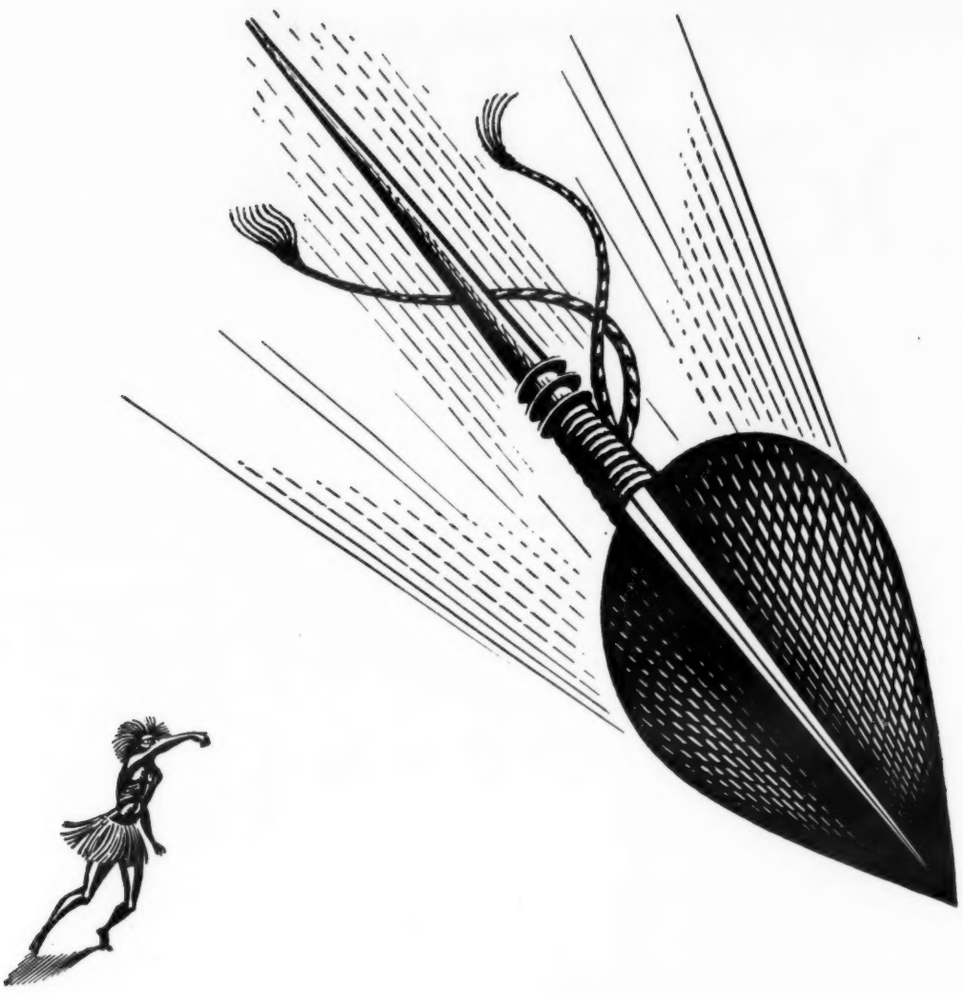

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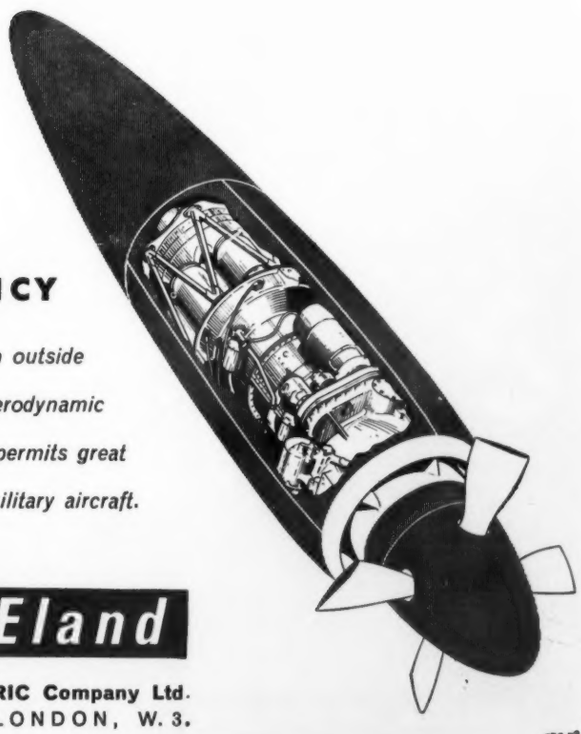

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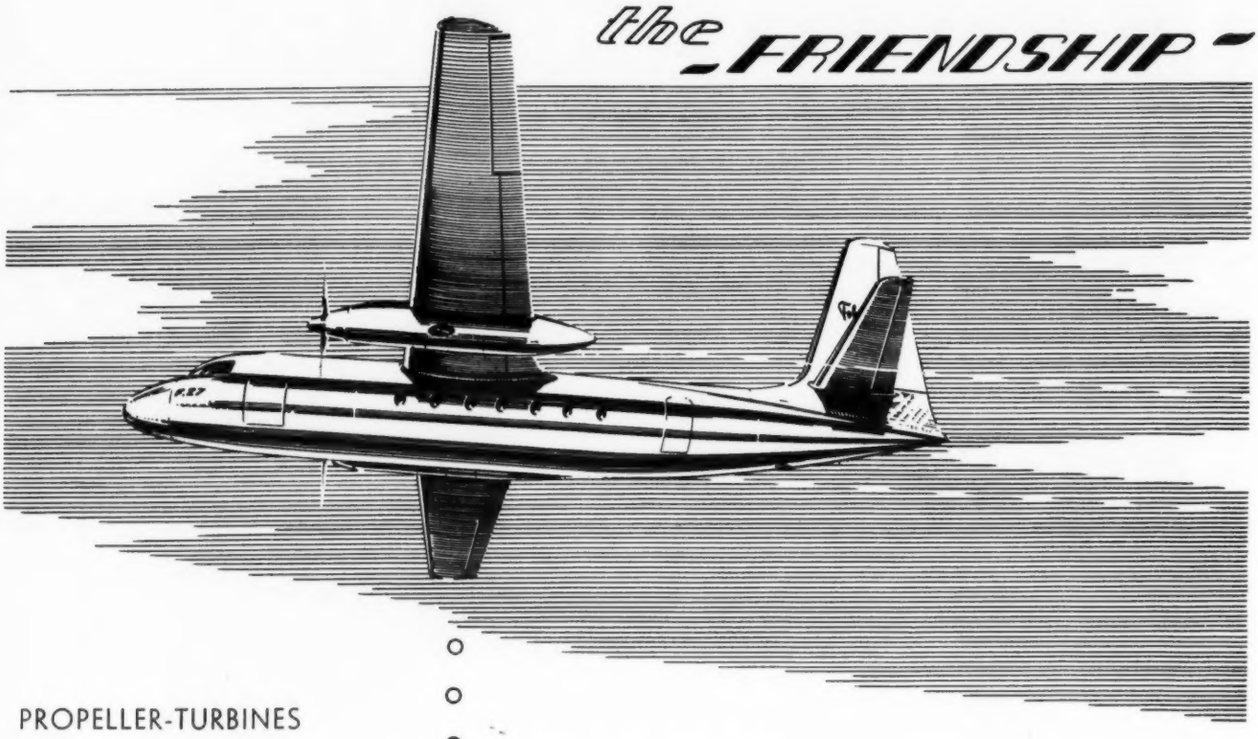


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Comfortably exceeding the speed of sound, it is one of the fastest planes in the world in its category • The ease with which it can be converted permits economical standardization of manufacture and use • It can readily be equipped with any of the most powerful jet engines, such as the ATAR, AVON, SAPPHIRE • Owing to its large capacity and useful load, the VAUTOUR has a long flight endurance (several hours) and can carry a very powerful armament • It can operate from short or makeshift strips.

**The VAUTOUR is the combat aircraft best suited to European needs**

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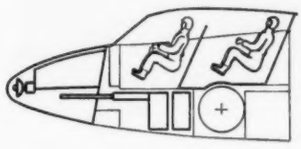
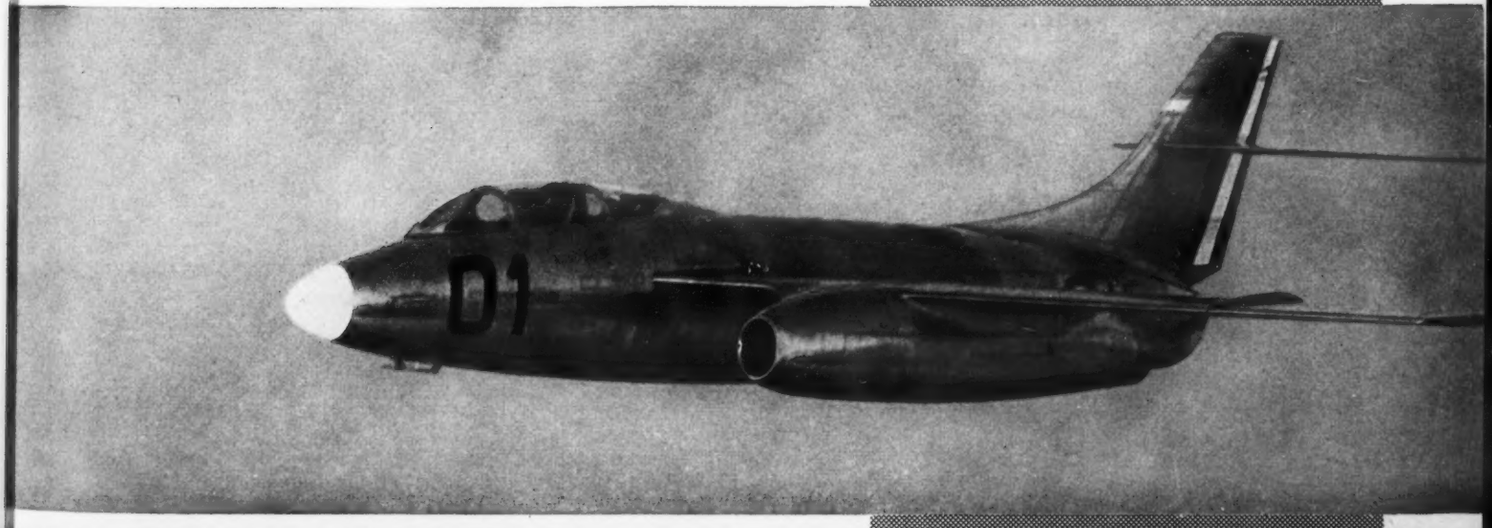


All-weather fighter

Ground attacker

Bomber

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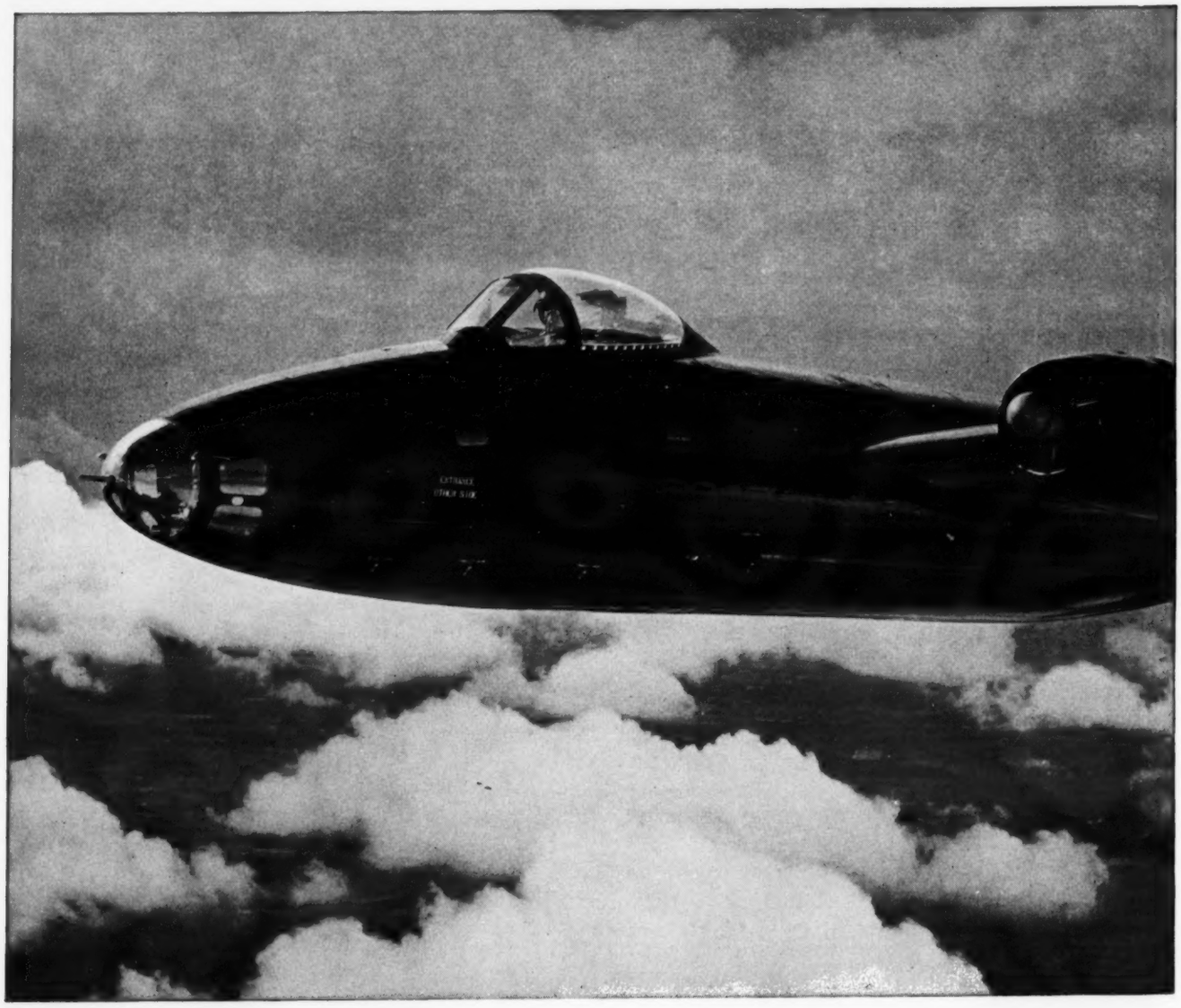

# Canberra B 8 'Night Intruder'

The Canberra B 8 is the most versatile of the Canberra series. It can readily be converted to perform a number of rôles, including night intrusion, high altitude bombing and target marking. In its Night Intruder rôle it carries underwing armament and forward-firing cannon in the bomb bay. The offset fighter-type canopy gives the pilot a superb all-round view and the re-designed navigator's compartment provides better vision and a wider range of navigational aids.

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# INTERAVIA

## Deadline Notes

No. 11, 1954

### FRENCH AIR MINISTER ON AIR ARMAMENT PLANS

The fighters now being produced in France, namely the Mystère IV day fighter and the Vautour all-weather fighter, can stand comparison with the best fighter types of other countries, Air Minister Diomède Catroux told the French Aero Club. - New types planned to carry guided missiles and reach supersonic speeds, will provide an effective preparation for any "war of tomorrow". Without disclosing State secrets, he could assure his listeners, he said, that French development of vertical take-off fighters (SNECMA) was in no way behind that of France's Allies. - Long-range bombers under development would be able to make reprisal raids over very great distances. - In collaboration with the Ministry for Scientific Research and the Atomic Energy Commission, the French aircraft industry had decided to undertake development of an atomic power plant for aircraft.

### U.S. AIR BASES IN LIBYA

A secret session of the Libyan Parliament has ratified a U.S.-Libyan agreement under which the United States may establish a number of air bases on Libyan territory and continue to operate Wheelus Field three miles east of Tripoli. In return the United States will pay $7,000,000 the first year, $4,000,000 a year for the next six years and $1,000,000 a year for another eleven years, a total of $42,000,000 spread over 18 years.

### I.A.T.A. TRAFFIC CONFERENCE IN VENICE

The Venice Traffic Conference, which closed on October 15th, made approximately 500 decisions covering the fares, rates and conditions of carriage on the international services of the 71 I.A.T.A. member companies for the year beginning April 1st, 1955. These tariffs will form the basis for the transaction of over $2,500,000,000 worth of business in 110 different currencies during that year. - Despite rising costs, passenger rates remain unchanged except in certain regions (in Europe, for example, there will be an increase of 2.5% on many routes). - No agreement was again reached on Atlantic cargo rates, so that it was decided to leave the question to the 13 airlines concerned with Atlantic cargo operations - with the recommendation that a solution be found before the expiry of the present rate agreement (March 31st, 1955).

### DOUGLAS DC-7D TURBOPROP AIRLINERS FOR B.O.A.C.?

A British press report that British Overseas Airways Corporation is negotiating with Douglas Aircraft Co. for an option on ten DC-7D commercial transports fitted with Rolls-Royce RB.109 propeller turbines (4,000 h.p.) has aroused lively comment. To counteract adverse criticism in Britain, B.O.A.C. has stated that its talks with Douglas are of an informal nature. The turboprop DC-7D would not be operational until 1958 or 1959, when the era of large propeller turbine aircraft, initiated by the Bristol Britannia, will be an accomplished fact.

### P.A.A.'s PAY-LATER SCHEME

Pan American World Airways' "Fly now - pay later" scheme, which has hitherto been applicable only for flights originating within the United States, has now been extended to American nationals domiciled in Europe. Down payment: 10%, rest in 12 monthly payments.

### GENERAL A. URBANI RETIRES

Italy's Defence Minister Paolo Emilio Taviani announced to several hundred officers of the 56th Tactical Air Force at the Maniago gunnery training centre, near Venice, that General Aldo Urbani, the creator of Italy's post-war Air Force and its Chief of Staff, is to retire shortly, on reaching the normal age limit.

* From INTERAVIA's world-wide news service, including INTERAVIA AIR LETTER, the daily international aviation news digest. — No part may be reproduced without written permission.

## ALL-WEATHER FIGHTERS FOR HOLLAND, NORWAY

The Netherlands Air Force is to order 28 American F-86K Sabre all-weather fighters and to receive another 28 from the United States under the arms aid programme, it is announced from The Hague. - Interavia's correspondent in Stockholm reports that the Norwegian Air Force also expects delivery of North American F-86 Sabres in 1955.

## NO MiG-15's FOR FINNISH AIR FORCE

Finland has rejected Russia's offer, made during the Russo-Finnish trade talks this summer, to supply MiG-15 jet fighters for the Finnish Air Force and Russian instructors to train Finnish jet pilots, according to Interavia's Stockholm correspondent.

## FIRST JAPANESE PARATROOP UNIT

The first Japanese paratroop unit to be created since the war completed its training at Hakota base on October 8th, 1954.

## SWEDISH GUIDED MISSILES

The development of guided missiles called for by General B. Nordenskiöld when Commander-in-Chief of the Swedish Air Force now appears to be taking place at an accelerated pace. At any rate the Swedish air estimates for 1955-56 list the sum of 25,000,000 crowns for continued development of an anti-aircraft missile, of which 3,000,000 crowns should be found in the current budget year. Guided missiles are also mentioned in connection with the armament for the Saab-32 Lansen supersonic ground attack aircraft, now in quantity production.

## LOCKHEED GUIDED MISSILES

The appointment of a number of guided missile experts to Lockheed Aircraft Corp. seems to indicate that the recently founded Missile Systems Division is to be expanded. New appointments include the following: Captain Steadman Teller (U.S. Navy, Retd.) - formerly Chief of the U.S. Navy's Guided Missile Section in the Office of the Chief of Naval Operations - as Senior Military Adviser to Lockheed's Department of Development Planning; Dr. Sydney H. Browne, formerly employed by the Rand Corp. and North American Aviation Inc. on the development of guidance and controls systems, as Superintendent of the Analytical Department, Engineering Branch, Missile Systems Division (during World War II Dr. Browne worked on the "Manhattan" atomic bomb project); C.R. Bumstead of the U.S. Atomic Energy Commission, as Manager of the Engineering Laboratories Department of the Missile Systems Division.

*

## WORKSHOP BRIEFS

A considerable number of older Boeing B-47 six-jet bombers (mostly B-47B's) is undergoing conversion to bring them up to the power plant and equipment standards of the B-47E Stratojet now in production. * On October 17th Billy T. Wester set up a new unofficial helicopter altitude record of 24,500 ft. in a Sikorsky XH-39 (S-59). * Engineers from SNCA du Nord and the Schneider Works have been making catapult tests with a Nord NC.856 artillery observation post, using a cable catapult system developed by Engineer Fieux. The same system can be reversed for precision landings. Take-off distance 65 ft., landing 40 ft. * Boeing KC-135 is the designation under which the Boeing 717 jet tanker aircraft will be introduced into the U.S. Air Force. * Bell 47H (three-seater with 200 h.p. Franklin engine) will be brought on to the market early in 1955. * The Piasecki H-21 helicopter is to be examined for the possibility of installing a gas turbine. * The Aircraft Industries Association of America states that work is now going on in America on "at least 26 different types of guided missiles". * Avro-Canada's new interceptor fighter (CF-105?) is said to have a ceiling of at least 50,000 ft. and a max. speed of Mach 1 in level flight. Gross weight between 15 and 20 tons. * The Glenn L. Martin Co., Baltimore, Maryland, is trying to interest military circles in a transport version of the B-57B twin-jet bomber; suggested use to carry staff officers etc. * Potez 6 D 02 engines (fitted for example in the Morane-Saulnier MS.733 trainer) have been authorized for 1,000 hours running between overhauls. * Firing trials of a guided missile are to be made in Japan at the end of November 1954. This first guided missile built in Japan since the war is said to have a max. speed of Mach 1.6.

* * *

# Germany Re-enters the Arena

Soon after the outbreak of World War II a certain American said, somewhat sarcastically, that Adolf Hitler's bust should have been set up in the lobby of the Pentagon, since America's generals had him to thank for their armies. Applying this remark to the present situation in Germany, it might be said that the bust of Joseph Stalin belongs on the staircase of the Federal Chancellery. But for the Russian attitude since 1946, but for the shock of Korea, West Germany's economic recovery would have been much slower, and such questions as sovereignty, rearmament and new German armed forces would not even have been discussed.

•

On August 29th, 1954 the European Defence Community, the dream of recent years, was finally buried without honours by the French Parliament. But on October 3rd, at the end of the Nine-Power Conference in London, the "integration of Europe" and the recognition of Germany as an equal partner among the European nations were accepted facts. The Brussels Pact, signed in 1948 and directed against Germany, was expanded into a European Seven-Power Agreement which is to unite Britain, France, Belgium, Holland and Luxembourg economically, culturally and militarily with Germany and Italy for the next fifty years.

•

At the London discussions Germany agreed to accept a "controlled rearmament," not to exceed the limits envisaged under the old E.D.C. treaty: twelve fully mechanized German divisions with a strength approaching 400,000 men, a tactical air force with about 1,300 aircraft and about 80,000 men, and certain naval forces with 20,000 men. Germany agrees not to use the so-called ABC weapons (atomic, bacteriological, chemical), certain guided missiles, long-range bombers and heavy warships. All other weapons are not only to be permitted to her, but may even be produced again by that same German industry that by 1945 lay smashed and to all appearance helpless for decades to come. Even certain guided missiles will be allowed, provided they do not exceed 6.56 ft. (2 m) in length, 0.98 ft. (30 cm) in calibre, 2,165 ft./sec (660 m/sec or approx. Mach 2 near the ground) in speed, and warhead 49.6 lbs. (22.5 kg) in weight. Proximity fuses may be used.

Under the London agreement a control authority will be incorporated in the Brussels Pact, to coordinate and supervise the whole of Western Europe's armament—not least the German.

•

The modest office of the "Federal Chancellor's Representative for Questions Connected with the Increase in Allied Troops" will now become a full-fledged Defence Ministry. Theodor Blank, the civilian, former trade union leader and present "Federal Chancellor's Representative," is expected to be named Minister. There is also talk of creating a War Economy Ministry, probably to be headed by Dr. Franz Joseph Strauss, at present Minister without Portfolio. These two authorities would be responsible for getting German rearmament under way and preparing Germany's contribution to European defence.

Germans estimate that it will take at least two years to put these plans into practice and cost at least 40,000,000,000 Marks or roughly $10,000,000,000. The mechanized twelve-division army would swallow a good quarter of this sum, while only one tenth is proposed for the future German air force... This plan has little in common with modern conceptions; in Britain and the United States, for example, roughly equal sums are spent on army and air force.

Certain names are already being tipped for leading positions in the German armed services, though none have yet been officially confirmed: former tank General Ludwig Crüwell as Commander-in-Chief, General Adolph Heusinger as Chief of Staff, General Hans Speidel as head of the delegation to Western European Union and N.A.T.O, of wich Germany now becomes a full member; Colonel Kurt Fett as head of the Planning Office, Colonel Johann Adolf Graf Kielmannsegg as liaison officer to Defence Minister Blank. Again not officially confirmed, but most probable, is the appointment of General Reinhard Gehlen as head of the Intelligence Service, and General Wolfgang Vorwald will probably remain in charge of technical development. General Vorwald is the only one of those named above who was in the old Air Ministry. No public suggestions have yet been made regarding the commander of the new German air force.

These new forces will need around 22,000 officers, including 40 generals, 250 colonels, 900 lieutenant colonels, 2,000 majors, 6,300 captains and 12,300 lieutenants. The junior officers' posts will probably be most difficult to fill, especially for the air force.

Britain's "morning gift" to the London agreement, namely an undertaking to maintain forces on the Continent (the four divisions and tactical air force already stationed there) for another 44 years, is a concession to French anxiety: twelve fully-motorized German divisions will thus be balanced by five American, five French, four British, four Belgian—Dutch—Luxembourg and about eight Italian divisions.

•

What of the German armament industry? If steel production, the foundation of all armament, reaches 20,000,000 tons a year and thus exceeds the 1938 figure by 10 %, this should suffice. Output of other materials is also adequate, and factories and tools are there.

While first deliveries of predominantly American equipment are coming in, Germany's own new armament industry can be developing. Both industry and its clients, the future German armed forces, start from an unusual position in that, not having any old stocks on their hands, they can create brand-new weapons for tomorrow. And the heavy industry in the Ruhr is the reservoir from which the whole armament organization will be fed.

Let there be no illusions on one point: the old German aircraft industry is a thing of the past; it will be overshadowed by new firms and new names. A break of ten years, the loss of virtually all financial and industrial resources and the departure of leading designers cannot be made good with a single stroke of the pen. Here, too, the heavy industry will take the lead, and some years of licence production will be needed to get the new aircraft industry going.

•

Federal Chancellor Konrad Adenauer flew to London for the Nine-Power Conference on September 28th, 1954 in an old British *Hastings* transport. On October 3rd he left the British capital on board a Vickers *Viscount* turboprop aircraft, which Sir Winston Churchill's Government had placed at his disposal. *EEH*

# FARNBOROUGH 1954

Vickers-Armstrongs emphasized the export success of its *Viscount 700* turboprop airliner. Trans-Australia Airlines first machine, shown above, has meanwhile been delivered.

Perhaps it was the rain, perhaps it was because few radically new aircraft types were demonstrated. Perhaps it was simply because the international fraternity of aviation journalists has become blasé—bored with supersonic bangs and screaming passes a few feet above the runway.

Whatever the reasons, aviation writers from all over the world went home from the Farnborough Show early in September, the Society of British Aircraft Constructor's 15th Flying Display and Exhibition, and proclaimed their disenchantment.

"Dull," they said. "Disappointing, nothing new." Were they right?

They were not right. It is true that fewer new prototypes than in earlier years thrilled the sensation-hungry occupants of the press-tent. True, the test pilots were more subdued than usual, flying as they did in driving rain and under a cloud base only a few hundred feet above the field.

What the disillusioned aviation writers should have borne in mind is the real purpose of the annual S.B.A.C. Display. The Display has never been intended to be a fun fair, an aerial Coney Island. Its purpose is to show potential customers what the British aircraft industry can produce and to sell these products all over the world. This aim was certainly reached again this year. More than five thousand officially invited guests came from ninety-three countries and territories to watch the flying from the rain-drenched field and to throng in the exhibition hall. And on the "public" days, the three days on which the British taxpayer is allowed to see what he is getting for some of his money, nearly 300,000 people paid their admission fees to see Britain's latest aircraft.

The sales aspect of the show was stressed on the opening day, September 6th, by Minister of Supply Duncan Sandys, Prime Minister Sir Winston Churchill's son-in-law, who reported that British exports of aircraft and aero engines were now earning the country £60,000,000 a year. Since 1948 the output of the British industry had risen two-and-a-half times, the labour force had increased from 145,000 to 230,000.

"Will all visitors clear the runway as the aircraft will be moved in preparation for the Flying Display..." That concerns the gentleman at the left, too.

*Producing and selling* was the theme of the show. And it was obvious that the emphasis of the British sales effort is not concentrated on airframes and engines alone. In fact, the most outstanding feature of the event was the Static Exhibition with its hundreds of stands displaying engines, equipment, instruments, accessories... *This* was the "hit" of this year's Farnborough, this vast range of British aviation electronics and equipment engineering compactly organized under one canvas roof. Here, also, the sales staffs were busiest.

"Production" was more evident in the aircraft park than it has been for many years. The new standard fighters of the Royal Air Force, the Hawker *Hunter* and the Vickers-Supermarine *Swift*, are coming off the lines and are finally joining the squadrons after overcoming their protracted teething troubles. Advanced versions

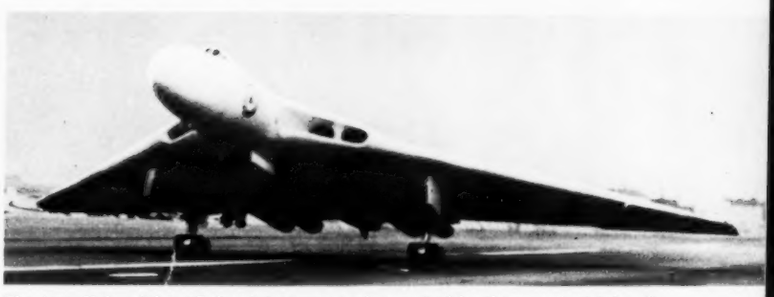
D.H. *Heron Mark II* feeder transport in the colours of the Turkish Airlines.

The first production machine of the Bristol 175 *Britannia* turboprop transport type shows off its graceful lines. About four of the type are to be delivered to B.O.A.C. by the end of the year.

D.H. *Comet 2*.

De Havilland's hope for the future: the *Comet 3* prototype.

A flying test bed, the "*Proteus Ambassador*". This is the second *Ambassador* prototype, today fitted with Bristol *Proteus 705* turboprops, shortly to be replaced by the more advanced *Proteus 755*.



The Avro *Vulcan* takes off. Spectators were again surprised by the very short take-off and landing runs.

have been developed—*the Hunter Mark VI* made several spectacular passes, the *Swift Mark IV* with an "all-flying tail" was demonstrated in flight. Hundreds of English Electric *Canberra* twinjet light bombers have been built and delivered, and the new night intruder version, the *Mark 8*, was on show at Farnborough. Five of the big Gloster *Javelin* twin-jet all-weather fighters were demonstrated, including four production machines; work is said to be in progress on a faster version of the type.

More important for Britain's economy was perhaps the fact that production is getting under way also in the civilian sector. The first production Bristol *Britannia* was there, and so was a Vickers *Viscount*, resplendent in the colours of Trans-Australia Airlines. Oldtimers such as the Bristol *Freighter* and the de Havilland *Heron 2* four-engined feeder liner showed that they are still very much in the market. All these transports are a practical reality today, the fruit of many years' design, development and testing. De Havillands also demonstrated their hope for tomorrow, the prototype of the *Comet 3* jet airliner, whose fate may well be affected by the *Comet 1* hearings that were due to open on October 19th.

Strategic bombers—medium heavy—were the only domain in which no production was noticeable. The first Avro *Vulcan* prototype (*Sapphire* engines) again dominated the aircraft park, paired by the prototype of the Vickers *Valiant B.2*. The second prototype of the Handley Page *Victor* crescent-wing bomber made its appearance on the latter days of the show. All three have been ordered under "super-priority" contracts, but the numbers involved are small. In London it was rumoured that the *Valiant B.1*—not exhibited at Farnborough, but about half a dozen are flying—will ultimately get a large contract, at the expense of the much longer-ranging *Victor* and *Vulcan*.

Real novelties were few. Excepted was the Folland *Midge* light aircraft, and it proved to be the most popular individual sensation of the show. Yet, it was not even a prototype. It is the precursor of the *Gnat* light interceptor prototype and a British expression of the international trend towards cheaper, single-purpose combat aircraft. A more practical example of this trend was the Short *Seamew* light anti-submarine patrol aircraft which has now been ordered into production by the Royal Navy; R.A.F. Coastal Command is also reported to be interested.

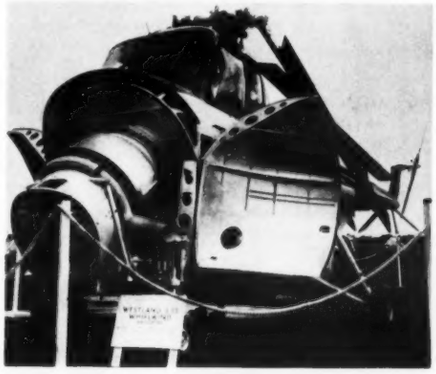
Big delta: the first Avro *Vulcan* prototype, with A.S. *Sapphire* engines.

At the other end of the scale, the Vickers-Supermarine 525 twin-*Avon*-powered experimental aeroplane is the forerunner of a very heavy naval strike fighter.

The two most exciting creations of Britain's aircraft designers during 1954 were carefully kept away from the S.B.A.C. Display, though their existence had been announced officially. They are, of course, the *English Electric P. 1*, prototype of the first British aircraft capable of supersonic speeds in level flight, and the Rolls-Royce "Flying Bedstead," the weird and wonderful wingless vertical take-off contraption serving strictly experimental purposes. Perhaps one or the other will be seen at Farnborough next year, together with several other new prototypes which—as London's scuttlebutt has it—are abuilding.

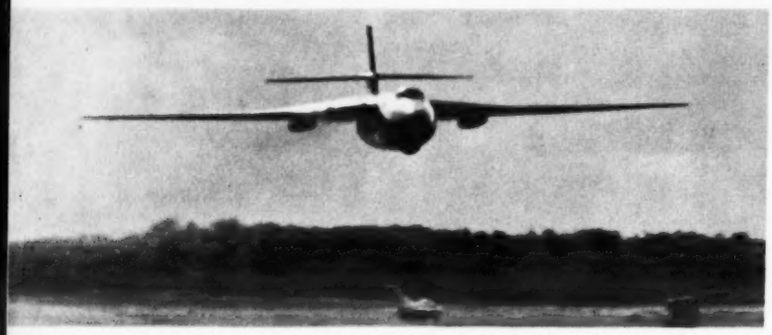
This, then was Farnborough 1954. Disappointing? Hardly. The 15th S.B.A.C. Display fully played its rôle as the sales show of the British aviation industry. A final bouquet: the organization of the event was exemplary, from the layout of the various halls and tents to the timing of the flying display.

No helicopter newcomers were shown. This is the well-known Westland-Sikorsky S.55, demonstrating engine accessibility and folding rotor.



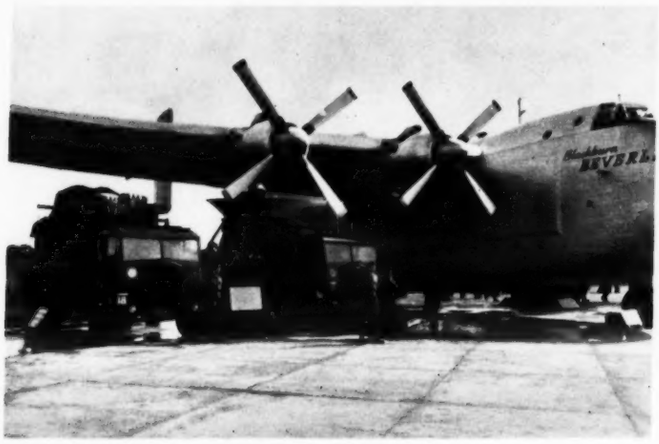
The veteran Bristol 171 *Sycamore* appeared in an ambulance version.

## Autumn highlights

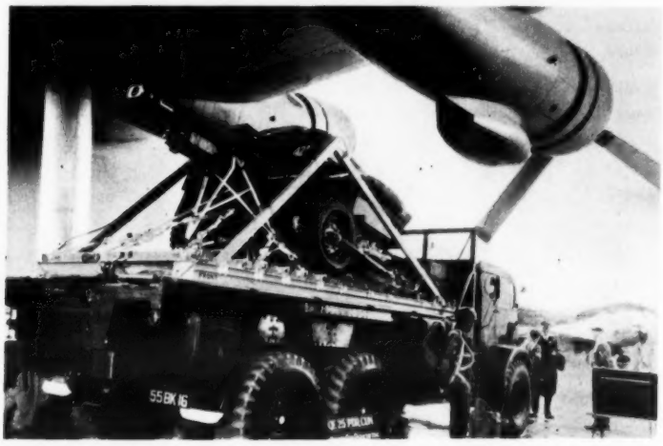


Vickers *Valiant B. 2* four-jet medium bomber prototype in a fast pass. *Valiant B 1.* is in production.

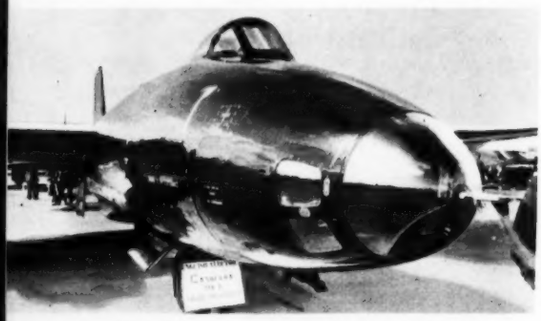
*Eighteen wheels!* The undercarriage of the Avro *Vulcan B. 1* prototype.



The *Beverley*. At left, a one-ton truck on its carrier, rigged for paradropping.



Load carrier. A QF 25-pounder gun of the British Army rigged for parachuting, ready to go aboard the Blackburn *Beverley* transport.



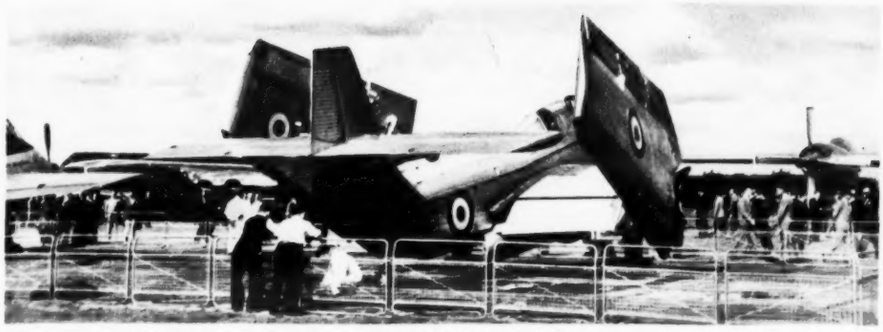
Nose of the *Canberra Mk. 8* night intruder. Four-gun pack is just discernible at left, to the right of undercarriage door.

English Electric's *Canberra Mk.8* night intruder prototype in flight. Several other *Canberra* versions were also demonstrated.

Fairey *Gannet T. Mk. 2* submarine chaser, trainer version.

Bird's eye view of the *Valiant B. 2* and the *Vulcan B. 1.*

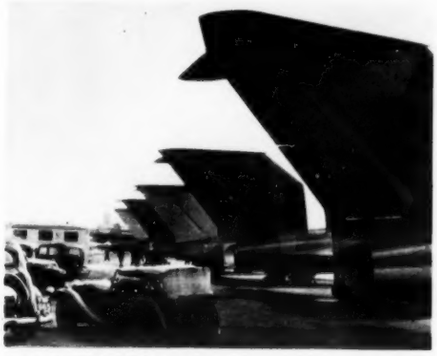
Praying Mantis. The Fairey *Gannet T. Mk. 2* folds its wings while taxying back to its dispersal point.



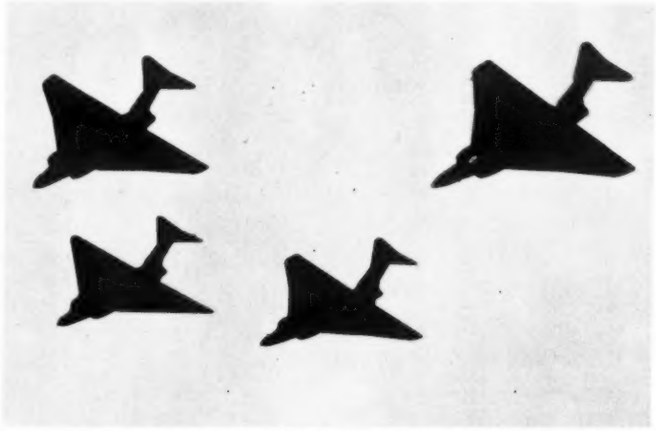
With wings folded the *Seamew* occupies very little space aboard aircraft carriers.

Close-up of the *Seamew's* wing folding mechanism.

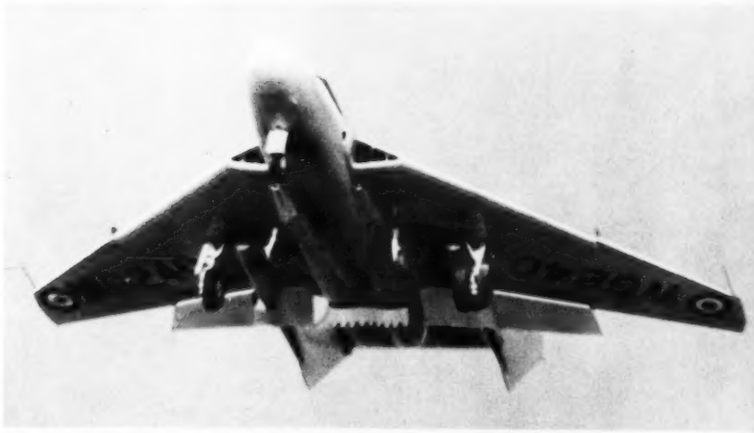
The *Seamew*, Short's cheap anti-submarine patrol aircraft.



Study in tails: five *Javelins*.



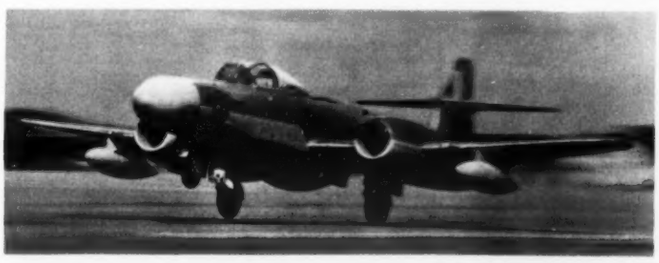
Four Gloster *Javelin* all-weather fighters in formation. The fifth had gone off on an individual demonstration.



The perennial de Havilland D.H.110 all-weather fighter prototype is still undergoing development.

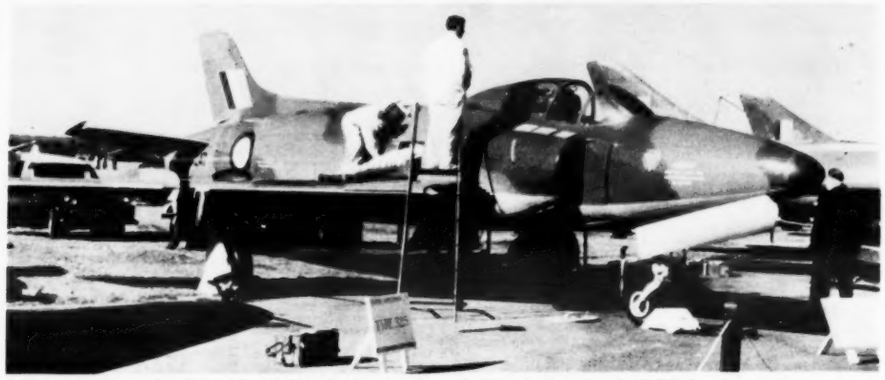
Nose for trouble. The Armstrong Whitworth *Meteor N.F.14* twin-jet night fighter.

The *Meteor 14* night fighter takes off.

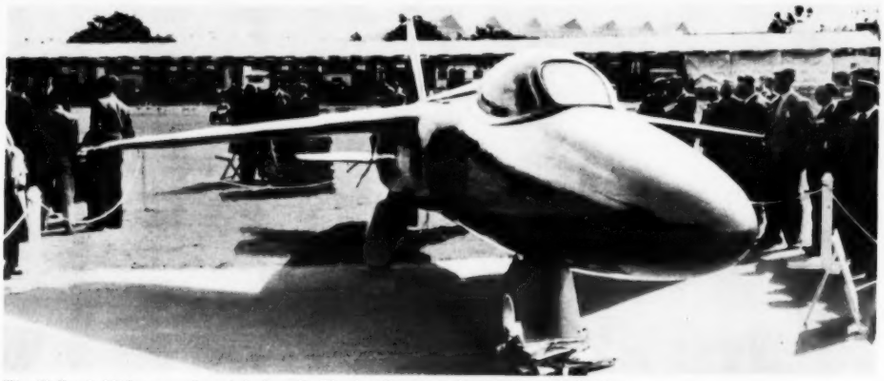


The Vickers-Supermarine 525 twin-*Avon*-powered experimental naval strike fighter.

The Hawker *Hunter F. 2* fighter. Power plant is an A. S. *Sapphire*. The F. 1 with a R.-R. *Avon* is the standard version.



A Vickers-Supermarine *Swift Mk.3* fighter in the aircraft park. Next to it was a *Swift Mk.6*.



The Folland *Midge* experimental aircraft. The landing gear doors act as air brakes.

The *Midge's* wing unit in the exhibition hall.

The visitor at left serves to emphasize the small size of the *Midge*. Power plant is an A.S. *Viper* of 1,640 lbs. s.t., later to be replaced by a Bristol *Orpheus* of 5,000 lbs. s.t.

Vickers *Valiant B.2* four-jet bomber. Note landing gear fairings, each large enough to house D. H. *Super Sprite* recoverable take-off rocket motors.

The Folland Fo. 139 *Midge* in flight.

## *The Air Hostess Told Us...*

No ladies, said the S.B.A.C., no ladies except working journalists. Still, we were not really surprised to see Esmeralda at Farnborough, just emerging from the cockpit of the *Vulcan*. You see, said our Favourite Air Hostess, I got in somehow; but then, perhaps I'm not a lady. Incidentally she found that she was not alone: never in her life, she confessed, would she have dreamed that so many working lady journalists could eke out a living . . .

Take this, she said, handing us a 35-millimetre film. I took some wonderful pictures—you publish the stuff, if possible under the title "Madame Tussaud goes to Farnborough . . ." All we found were three exposures, reproduced herewith together with Esmeralda's explanation.

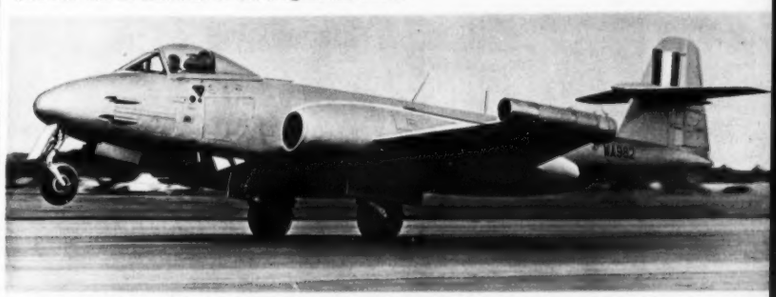
The one at the top, she says, is the fellow who hanged himself in the Blackburn *Beverley*. The one in the middle I forget, but I think it is the pressure cabin of a new jet airliner. The one at the bottom is the quickest way to heaven, some kind of vertical take-off machine, for individual use . . .

Wait a minute, we interpolated, you're going off the rails. Here is what the pictures really are: top—a paratrooper dummy suspended in the *Beverley's* parachute exit; middle—the interior of the flame tube of an *Avon* jet engine, this one mounted in a *Canberra* bomber; bottom—BELIEVE IT OR NOT, *Interavia's* Technical Editor takes a ride on Martin-Baker's ejector seat test rig. (The protuberances are hiss knees.)

The Fairey FD-1 delta, one of the smallest at the show, originally designed as a vertical take-off machine – perhaps as a missile. Its manoeuvrability and speed – including touch-down and landing run – were impressive.

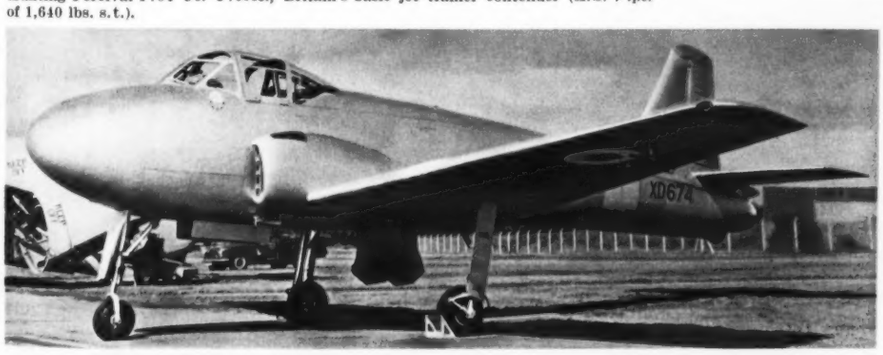
One of the most interesting experimental aircraft was the Short SB.4 *Sherpa*, powered by two turboméca *Palas* engines. Main feature of this scale model (of future high-level high-speed bombers) is its aero-isoclinic wing.

Hunting Percival *Pembroke C.1* communications, transport and training aircraft. This one will be delivered to the Belgian Air Force.

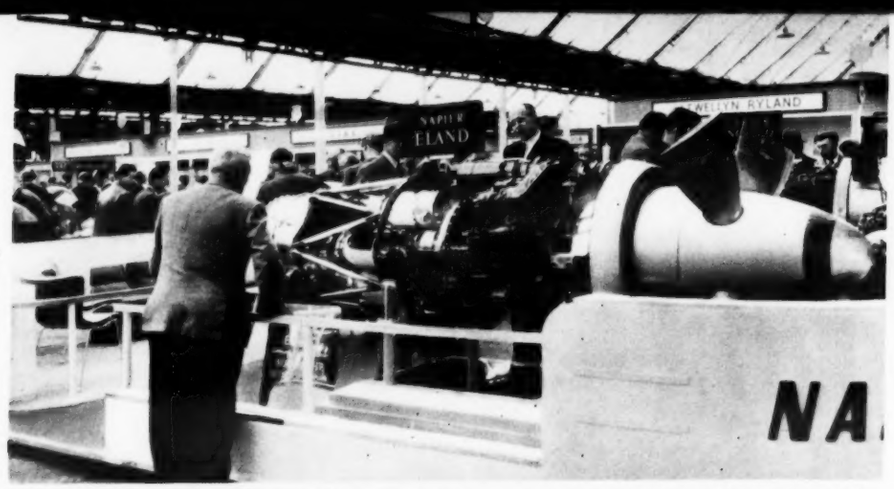


A *Meteor* test bed for the Rolls-Royce *Soar* short-life engine (wing tips). Each engine weighs 275 lbs. but delivers 1,810 lbs. of thrust.

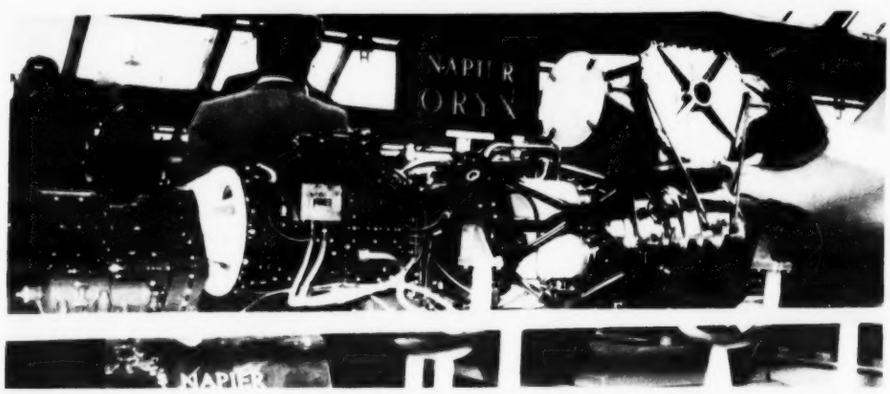
Hunting Percival P.84 *Jet Provost*, Britain's basic jet trainer contender (A.S. *Viper* of 1,640 lbs. s.t.).



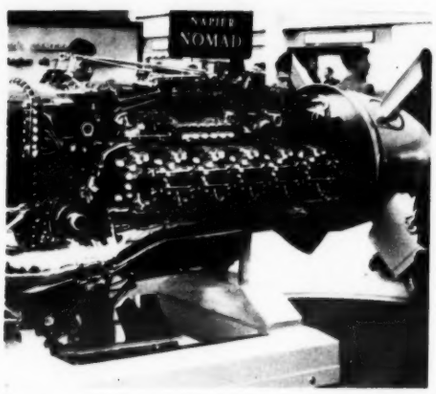
# British Aircraft Engines at Farnborough




The Napier *Eland* propeller turbine for 3,000 e.h.p. at 12,500 r.p.m. shows (left to right): Rotol four-blade propeller, 10-stage axial compressor, six combustion chambers, three-stage turbine, exhaust pipe.

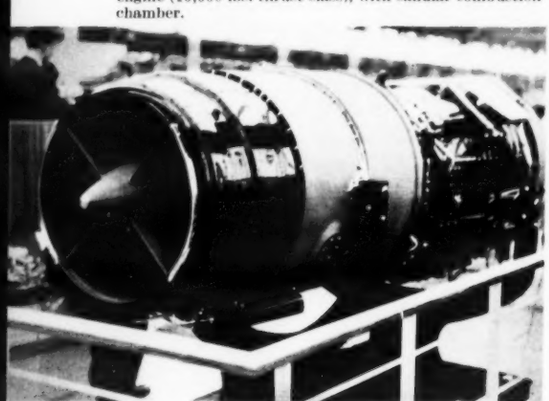



Napier *Oryx* turbo gas generator for 750 gas horse power. Left to right: auxiliary equipment, front axial compressor, five combustion chambers, rear axial compressor with controllable two-way valve to mix the turbine gases with compressed fresh air.

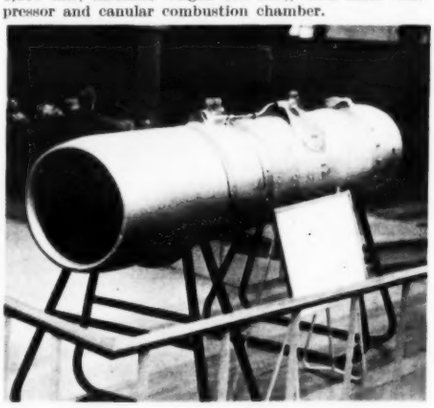



Napier *Nomad* twelve-cylinder two-stroke diesel compound engine (3,135 e.h.p.), with axial compressor and exhaust gas turbine.

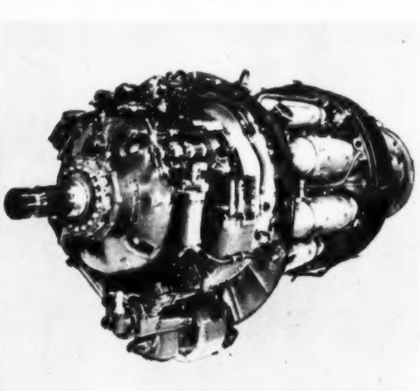
Rolls-Royce *Avon RA.26* axial-compressor turbojet engine (10,000 lbs. thrust class), with canular combustion chamber.



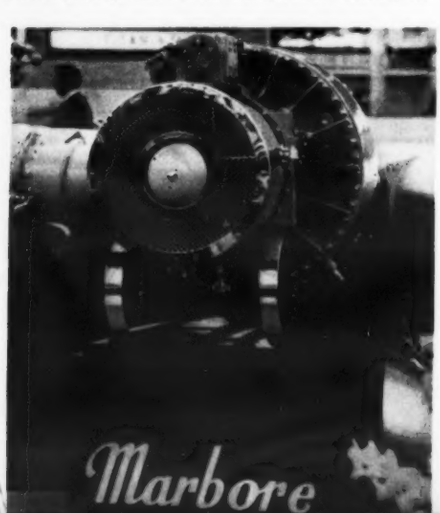
Rolls-Royce *Soar* short-life jet engine (take-off thrust 1,810 lbs.; installed weight 267 lbs.), with axial compressor and canular combustion chamber.



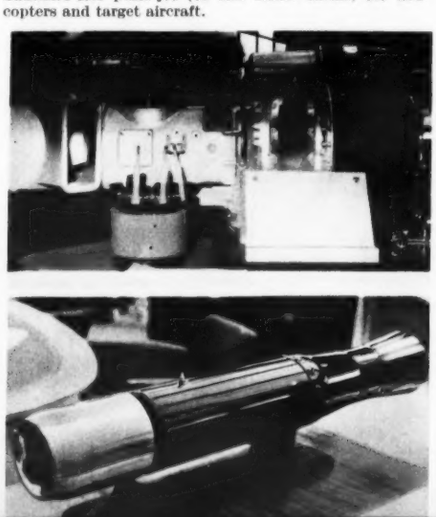
Bristol *Proteus* propeller turbine, the latest 755 version of which delivers a top power of 4,150 e.h.p.



*Marboré* jet engines of 880 lbs. thrust (along with *Palas, Palouste, Turmo* and *Artouste*) are built by *Blackburn & General Aircraft* under licence from Société Turboméca.



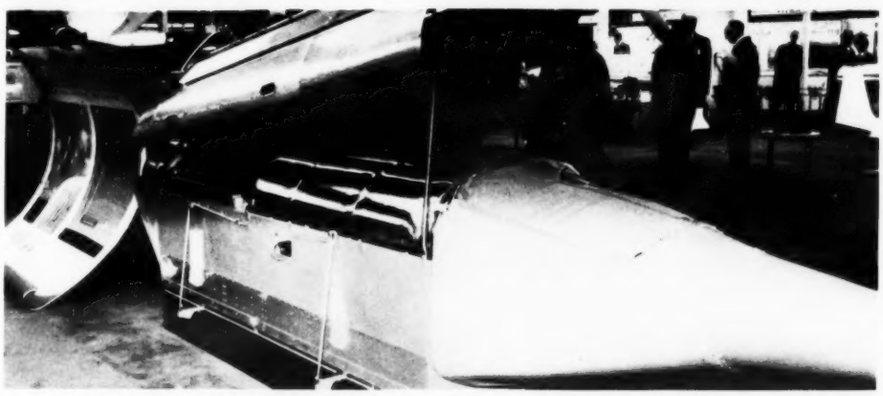

Top: *Rover IS/60* 60 h.p. gas turbine with LA 3016 alternator, made by *British Thomson-Houston*. *Bottom: Saunders-Roe* pulse-jet (45 lbs. static thrust) for helicopters and target aircraft.



Alvis *Leonides Major* 14-cylinder two-row radial delivering 870 h.p. on take-off (at 3,000 r.p.m.) and a continuous power of 700 h.p. (at 2,900 r.p.m.): diameter 38.9 ins; dry weight 1,060 lbs.

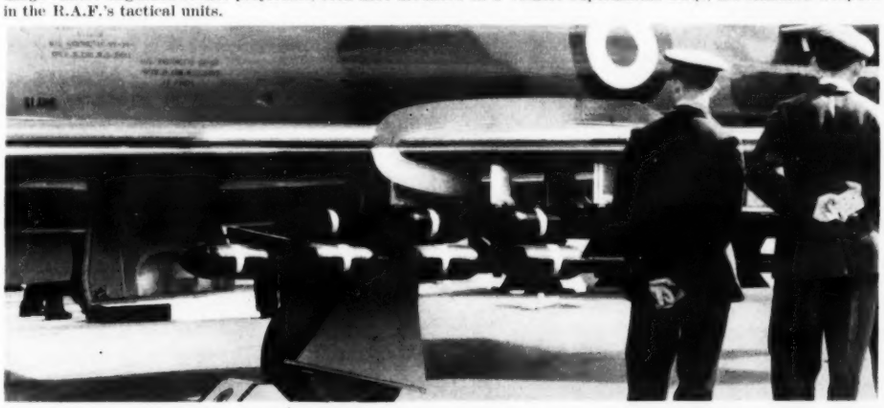
# The Commonwealth's Rockets

This not-very-new test vehicle - cruciform rectangular wings and narrow off-set tail vanes – was displayed on the *de Havilland* stand.



The *de Havilland Super Sprite* assisted take-off rocket, housed along with propellant tanks (hydrogen peroxide and solid catalyst, gasoline or kerosene), parachute (top, front) and landing shock absorbers in a special pack, can be safely jettisoned after take-off and will be ready for re-use. Max. thrust 4,000 lbs; total impulse 120,000 sec./lbs; total weight 1,900 lbs.

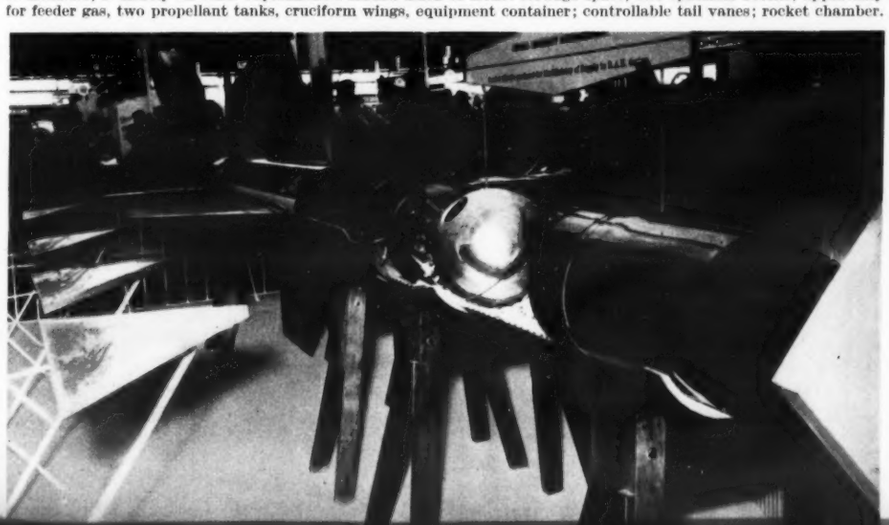
Large-calibre unguided rocket projectiles, seen here mounted on a Vickers-Supermarine *Swift*, are standard weapons in the R.A.F.'s tactical units.

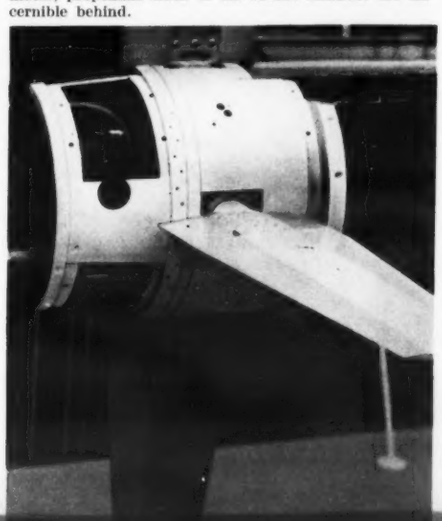


*Fairey Aviation Company of Australasia* showed a supersonic experimental rocket test vehicle developed for the joint account of the British and Australian governments. Total length, including take-off booster unit, 23 ft.

Developed by the *Royal Aircraft Establishment* for the Ministry of Supply, this guided missile, 17 ft. long and 15 ins. in diameter, is merely an older experimental model. Back to front: stowage space, two spherical bottles, apparently for feeder gas, two propellant tanks, cruciform wings, equipment container; controllable tail vanes; rocket chamber.

The *controllable tail vanes of the RAE rocket* are of light metal; propellant leads to the rocket chamber are discernible behind.





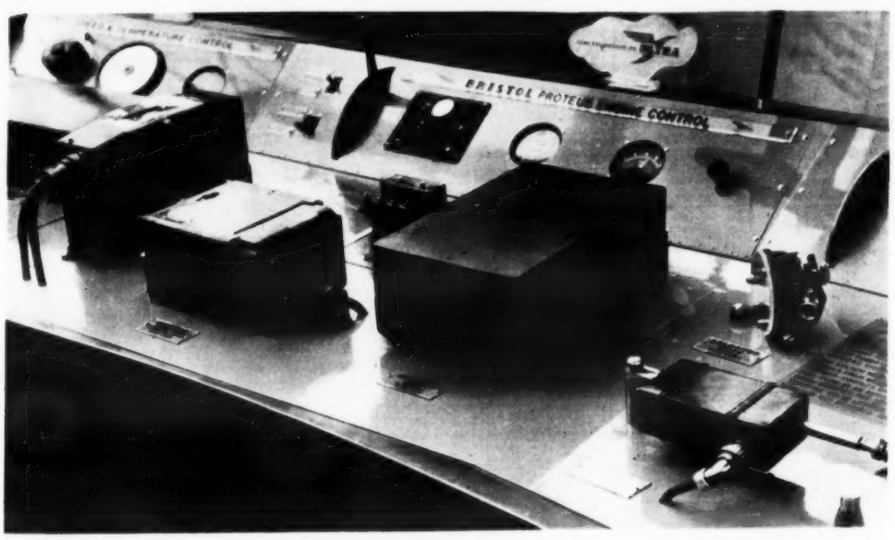
# Accessories Round-Up

FARNBOROUGH 1954

*The variety of equipment and accessories shown in the 100,000 sq. ft. exhibition "hall" at Farnborough this September was so overwhelming that it is only possible to give a "representative cross-section" in these pages. Altogether there were 262 stands (not counting the 19 large stands of the airframe and engine manufacturers), on which a roughly equal number of firms showed thousands of interesting accessories, new structural materials, new production methods, to visitors from Britain and overseas. The most striking exhibits of 22 firms have been chosen for mention below, but other items will be described in this feature in forthcoming issues.*

**● Automatic power control for propeller turbines**

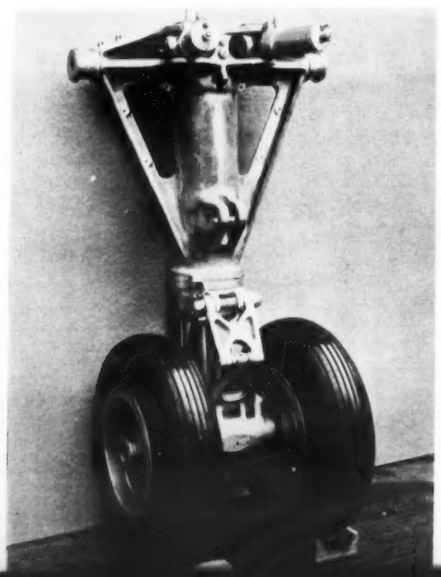
*Ultra Electric Ltd.*, London (makers of the SARAH air-sea rescue D/F transmitter and receiver) have designed in conjunction with the Engine Division of The Bristol Aeroplane Co. Ltd., the electronic equipment pictured here for control of compressor speed and propeller pitch in the *Proteus* propeller turbine. Whereas compressor speed is controlled by the pilot via the fuel throttle (top left), i. e., by varying fuel flow (by means of an automatic device which simultaneously allows for barometric pressure at the air intake and for gas temperature), propeller pitch is selected fully automatically. An electronic governor (front left) controls the flow of pressure oil to and from the hydraulic propeller pitch mechanism.

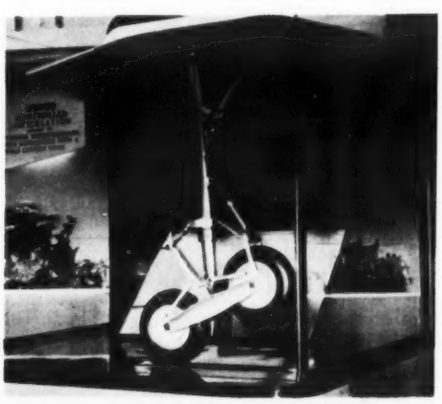


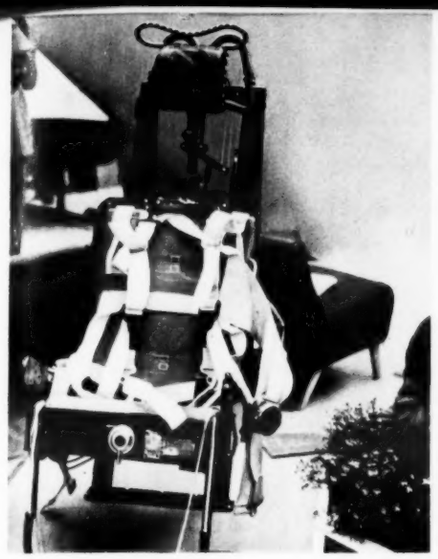

**● Long legs for fast airliners** are built by *British Messier Ltd.*, Gloucester, subsidiary of Rotol Ltd. and sister firm to the French firm of Société Messier. Picture shows the nose-wheel unit for the Bristol *Britannia*, complete with retraction rods and steering system, and the main and nose-wheel units for the Folland *Midge* lightweight fighter prototype. British Messier also make hydraulic pumps for 4,000 lb/sq. in. (with 9 h. p. Rotol electric motor).

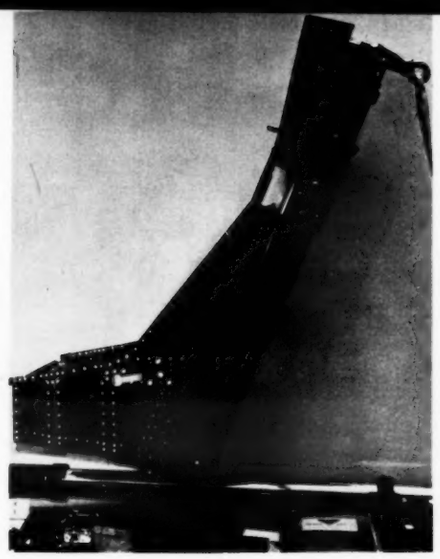
**● Hydraulic power steering for a nose wheel** was demonstrated by *Electro-Hydraulics Ltd.*, Warrington, Lancs. in an assembly for the Handley Page *Victor*. Two jacks (4,000 lbs/sq. in.) steer the twin wheels, with a mechanical follow-up, to the position corresponding to the undercarriage control wheel in the pilot's cockpit. The unit remains free to absorb ground forces, and shimmy dampers are provided. After take-off the jacks centre the nose-wheel ready for retraction.

**● How a sturdy undercarriage can be retracted into an extra-thin wing** was shown by *Dowty Equipment Ltd.*, of Cheltenham, by means of a model. The complicated retraction system for this main undercarriage with tandem wheels (with Dowty Liquid Springing) is known as Controlled Articulation. An interesting point is that the front wheel hangs lower than the rear and thus touches down first; it is damped by an auxiliary cylinder at the rear.



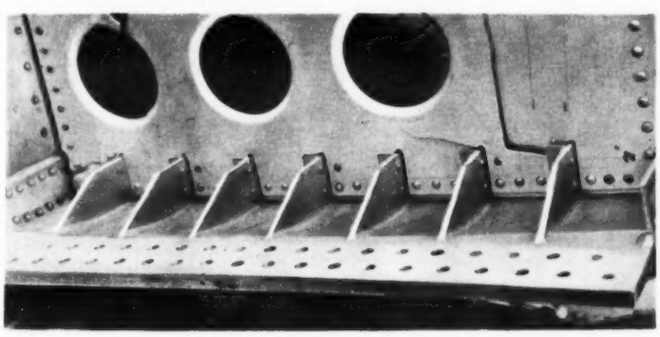






● **Lightweight ejection seats** weighing less than 50 lbs. are being built by *Folland Aircraft Ltd.,* of Hamble, near Southampton, partly under licence from Svenska Aeroplan A. B. and partly to its own design, for the *Gnat* lightweight fighter or similar aircraft.

● **A bare 50 lbs.** is the weight of the new Mark 4 automatic ejection seat developed by *Martin-Baker Aircraft Co. Ltd.,* Wolverhampton. Other seats in production are the standard Mark 2 (for fighters etc.) and the Mark 3 (for the V bombers). — Since a practical trial is more convincing than mere optical inspection, Martin-Baker also had a 50 ft. (mobile) *test rig for ejection seats* at Farnborough.



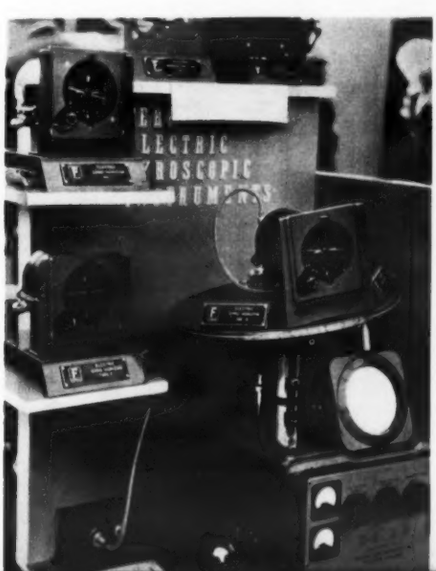
● **Integrally stiffened wing spars** have been introduced into Europe by *Short Brothers & Harland Ltd.,* of Belfast. Duralumin sheets 10 ft. 6 ins. long and 2 ft. wide — and originally 2½ ins. thick — are machined to a skin thickness of 0.275 ins. at the root and 0.056 ins. at the tip, leaving thin webs. Static tests eventually caused rib failure, but no "skin" buckling.

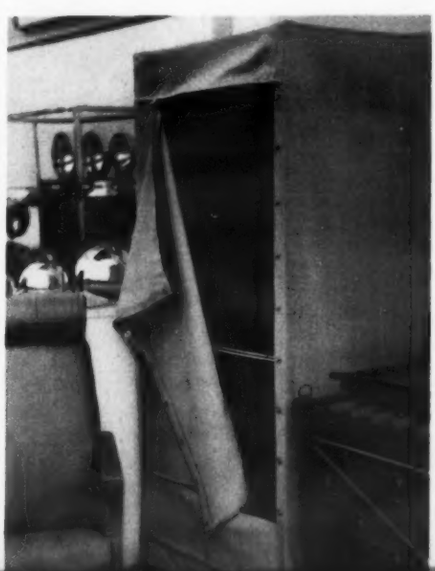
● **A laminated plastic drop tank** was the most striking exhibit of *Marston Excelsior Ltd.,* Wolverhampton. It is made of glass cloth impregnated with Nuron resin and moulded. The model shown (capacity 90 gallons) features good aerodynamic characteristics and high surface smoothness. Other products include plastic radar covers.

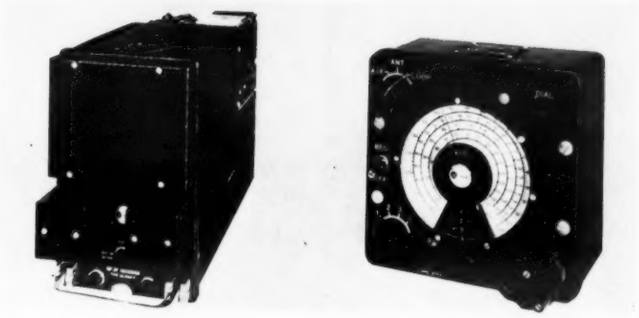
● **Mark XI oxygen breathing apparatus,** with economiser, hose and microphone mask. — Earphone helmet and goggles complete the stratosphere pilot's equipment *(Siebe, Gorman & Co. Ltd.).*

● **Electrical gyro horizons** for 360° rolling freedom and ± 85° pitch are built by *Ferranti Ltd.,* Edinburgh, to Ministry of Supply specifications.

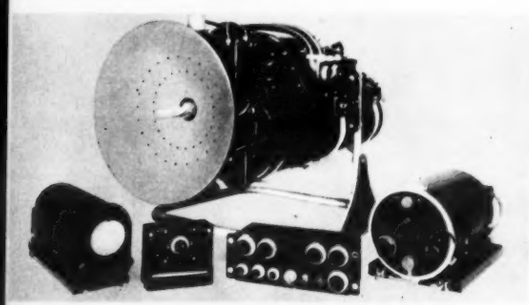
● **Lightweight fabric containers** for air carriage of clothing, and metal containers for heavier cargo were shown by *Airwork Ltd.,* London.



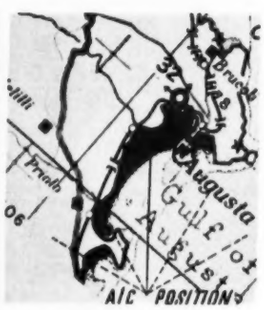




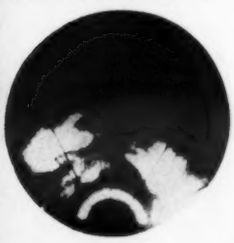
● **Electronic equipment of all kinds and industrial X-ray equipment** was offered by the newly-founded *Commonwealth Association in Air Radio*, on whose empire the sun never sets. The Association is formed of Britain's *Marconi Instruments Ltd.*, and *Marconi's Wireless Telegraph Co. Ltd.*, Australia's *Amalgamated Wireless (Australasia) Ltd.*, and Canada's *Canadian Marconi Company*. The new AD 7092 C radio compass for short and medium waves (150 kc/s to 2 mc/s), whose receiver and control unit (type 1274 A) are shown here, aroused particular interest. The first three *Viscounts* ordered by Capital Airlines will each have two AD 7092 C compasses. Bearing accuracy ± 2°; visual or aural indication; power supply 28 V D. C. and 115 V 400 c/s A. C.



Gap between two cumulo-nimbus clouds




Map of Augusta harbour, Sicily



Radar picture of cumulo-nimbus clouds

Radar picture of harbour, with echoes from ships

● **Airborne civil radar**

An E38 (or E38B) 3-cm civil airborne search radar developed by *E. K. Cole Ltd.*, of Southend-on-Sea, was shown on EKCO's stand at Farnborough and demonstrated at neighbouring Blackbushe airfield in a twin-engined Avro *Anson IX*. The equipment, first of its kind in Europe, is used for the following purposes: 1—to warn pilots of commercial aircraft of cumulo-nimbus clouds, to enable them to avoid areas of severe turbulence. 2—to warn against high ground in the flight path; 3—for bad weather navigation by the radar map of ground features ahead (obscured by cloud). Picture shows that the equipment consists of a scanning unit (E31 or E31B) in the fuselage nose, with horizontal sweep paraboloid (and dipole), a stationary transmitter-receiver unit (E32) and a number of other units housed inside the aircraft. These are, left to right: one (or more) cathode ray tubes (indicator unit E 34); control unit (E 35); junction box (E54); synchroniser unit (E33).

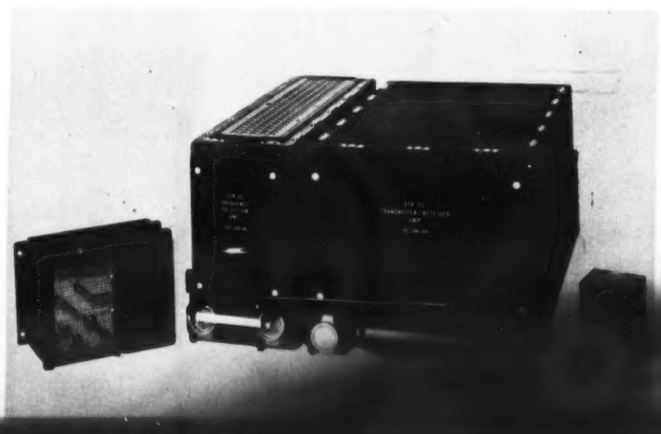
The 18-inch aerial reflector which normally sweeps over an arc of 75° in azimuth to either side of the aircraft's axis, can pick up any cumulo-nimbus clouds or high ground in this sector. By means of the tilt control switch on the control unit the scanning axis of the reflector can be tilted 10° above or below the horizontal, the latter position being used particularly for bad weather navigation. The scanning unit is gyro stabilized so that it works correctly even in turns. E32 transmitter-receiver uses a 10 kW 3-cm magnetron with a pulse frequency of about 700 pps and a 1$\mu$ sec pulse. A single aerial is used for both transmission and reception.

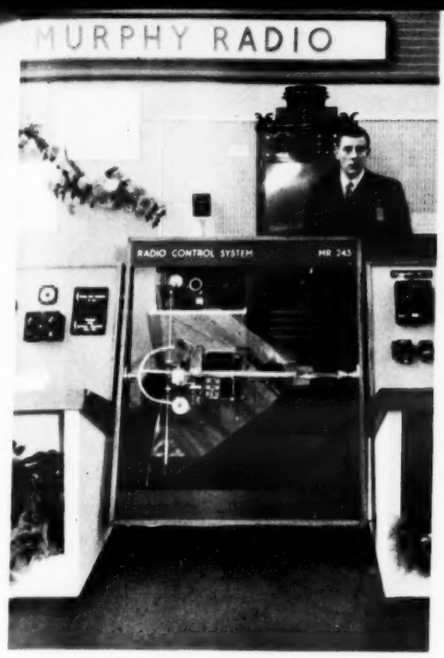
The indicator unit containing the cathode ray tube can be set (by means of the synchroniser unit) to correspond to two different ranges, 10 and 40 nautical miles. It is normally mounted in front of the first pilot, who can thus watch it himself in critical moments. If required a second indicator unit can be fitted on the navigator's desk.—Other data: power supply 115 V 1,600 c/s single-phase A. C. (350 VA) plus 115 V 400 c/s three-phase A. C. (300 VA) plus 24-28 V D. C. (5 W); total weight approx. 185 lbs.

The value of the equipment for turbulence warning and "map painting" is shown by the accompanying comparison between map (or photograph) and "radar picture". In the event of threatened collision with high ground at the altitude of flight the bright echoes would lie exactly in the centre line of the cathode ray tube and extend to the upper edge. Ships at sea (e. g. in Augusta harbour) also give clear echoes, but the equipment is not yet capable of warning against collisions with other aircraft. B. O. A. C. has issued a letter of intent for 18 EKCO radar sets (unit price approx. £4,000), for the *Britannia* and *Comet 3* long-range aircraft.

● **Military VHF transmitter-receivers for 20 channels,** which can be selected from a total of 560 frequencies (with 100 kc/s interval between channels) or 623 frequencies (interval of 90 kc/s) in the VHF band between 100 and 156 mc/s, are manufactured by *Standard Telephones and Cables Ltd.*, London, under the designation STR. 20.

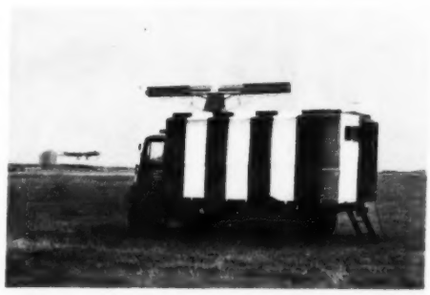
Picture shows, left to right: channel selector unit for 20 channels; frequency selector unit; transmitter-receiver; control switch for pilot. The new STR. 20 transmitter-receiver is a successor to the STR. 9 X series of VHF airborne radio equipment, of which more than 20,000 are in service with air forces throughout the world.

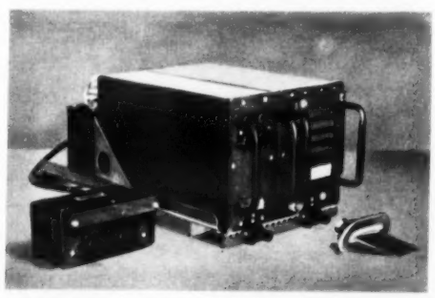




● **Miniature radio guidance systems (type MR 243)** for target aircraft or guided missiles are built by *Murphy Radio Ltd.* of Welwyn Garden City, Herts., makers of R/T and radio navigation equipment of all kinds, including in particular 200 mc/s DME equipment (cf. left-hand picture; DME ground beacon in background).—The MR 243 remote control system consists of a tone-modulated transmitter (right-hand picture) with short whip aerial and "microscopic" remote control "joystick" (discernible under the plus sign) and a receiver on board the target aircraft, here (left-hand picture) symbolized by a plastic model. The receiver also has a whip aerial; the tone-modulated pulses are converted in electric servos into elevator, aileron and rudder deflections. The model faithfully obeys even the slightest movements of the miniature joystick... provided no curious spectator stands between the transmitter and receiver aerials.

● **Plastic radar reflectors** are used by *Cossor Radar Ltd.*, London, for the scanner of their A.C.R. Mk. VI surveillance radar (10 cm). Despite its considerable diameter of 14 ft., the reflector is made in one piece, of resin-bonded Durestos-Dufaylite-Durestos sandwich construction, and is light in weight and very strong. The surface is sprayed with a thin coating of metal. Accuracy (overall tolerance $\pm$ $^1/_{16}$ in.) is unimpaired by either wind forces or temperature and weather effects.

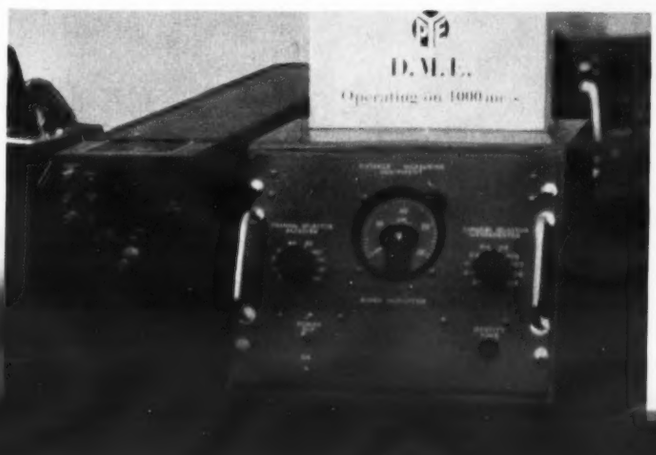




● **Secondary surveillance radar for busy airports** (and for jet pilots, who are generally in a greater hurry to land than other airport users) is at an advanced stage of development at *Cossor Radar Ltd.*, London. A mobile experimental airport equipment (left-hand picture) for ranges of 150 nautical miles and altitudes of up to 50,000 ft. has already been tested at London Airport. The airborne transponder, which every aircraft to be covered by the system would have to carry, is seen in the right-hand picture (with aerial in foreground). Signals from the secondary radar can be shown on the screen of a primary radar. The ground aerial (20 r. p. m.) can be mounted on a primary radar aerial assembly.—Characteristic data: interrogator frequency (equal to airborne receiver frequency) 1,215 mc/s; receiver frequency (equal to airborne transmitter frequency) 1,375 mc/s; pulse frequency less than 300 c/s; four possible codings for automatic response from the aircraft; weight of airborne equipment 30 $^3/_4$ lbs.

● **Airborne DME equipment for 1,000 mc/s** is now being built by *Pye Limited,* of Cambridge, under licence from the American firm of Hazeltine Electronics Corporation. The airborne equipment, designated Model 1800, consists of an interrogator unit (on left in picture) and a control and indicator unit (right) for two ranges: 0—40 nautical miles and 0—200 nautical miles. — *Ferranti* also make airborne DME equipment for 1,000 mc/s to I.C.A.O. specifications.

● **Lightweight VHF equipment for gliders** (Gliderphones) are offered—with larger R/T equipment for commercial and service aviation—by *Pye Limited,* Cambridge. To facilitate installation, the battery box (right) is separate from the transmitter-receiver (with microphone and earphone). Far left the short whip aerial. Used in conjunction with a 15 W fixed or mobile ground station, Gliderphones have obtained ranges of 80 miles or more.

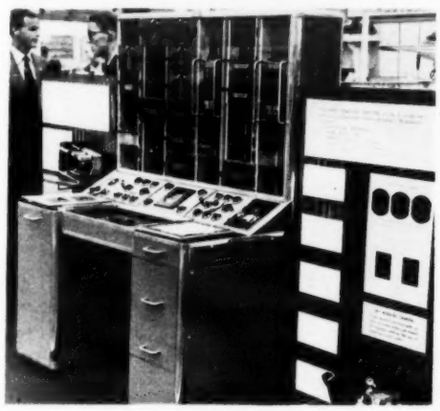


● **Pyrene Mark 6** is the designation of this cross-country fire tender made by *The Pyrene Company Ltd.*, of London. It can spray 10,000 gallons of foam extinguisher in two minutes. Auxiliary equipment carried includes two hoses for chlorobromomethane; Alvis six-wheel chassis with four steerable wheels; Rolls-Royce engine.

### ● General purpose analogue computor

The *Precision Engineering Division of Short Brothers & Harland,* Belfast, has developed a general purpose analogue computor which is now in production for various research establishments and industrial organizations, such as the Royal Aircraft Establishment, Handley Page, Vickers Armstrongs Ltd. (Supermarine Division), Admiralty Gunnery Establishment, Nationaal Luchtvaart Laboratorium, Amsterdam.

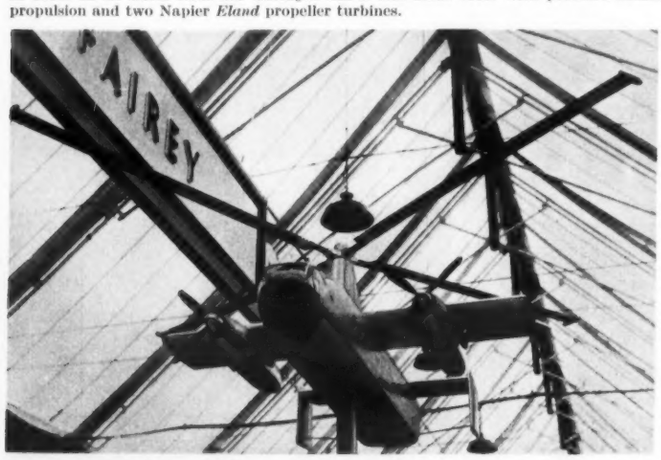
The lightweight installation (600 lbs) is mounted on castors and serves the following main purposes: solution of differential equations occuring in a wide variety of problems such as aircraft stability and control, structural design and vibration analysis; design of servo systems, such as automatic pilots and control systems for guided missiles and aircraft and industrial regulating systems; determination of optimum design of electrical, mechanical and thermodynamic systems and simulation of the behaviour of such systems. The console consists of a double-pedestal desk surmounted by a rack into which various combinations (up to 36) of computing units may be inserted. All computing units are interchangeable and secured with quick-release fasteners, electrical contact being made automatically. The terminals of all the computing units lead to an arrangement of sockets, called the Setup Panel, which is recessed into the top of the desk. The sockets are disposed so that any problem can be established simply by bridging adjacent sockets with small two-pin plugs. As a further simplification blank charts are provided which can be marked with the positions of the plugs for any problem. The cycle of operations is repeated (up to 15 times a second) and the solution is observed on the screen of a cathode ray tube, which has a long afterglow. When a satisfactory solution has been obtained it may be transferred to the chart of the pen recorder. A sweep expansion control is provided to enable an enlarged view of any part of the solution to be obtained. A second trace on the cathode ray tube screen depicts a time scale divided into tenths on all speed ranges. An automatic system of drift correction eliminates the necessity for frequent manual adjustment of the amplifiers in the computing units, and also enables the computers to deal with problems having divergent solutions. An installation fitted with 36 computing units will deal,



with some reserve capacity, with the general case of three second-order differential equations, particular cases involving four second-order equations, or one or two equations of correspondingly higher order. Two or more computers may easily be linked together with synchronized timing, for more complicated problems, a triple installation being capable of dealing with a general six-degrees-of-freedom problem. *Dimensions:* height 5 ft. 6 ins., width 4 ft. 3 ins., depth 2 ft. 7 ins. Accuracy of individual computing units ± 1 %.

## MODELS OF FUTURE PROJECTS

*Fairey Rotodyne*, a compound helicopter, which will be ready for flight testing early in 1956. In its latest form the *Rotodyne* has a four-blade rotor with pressure nozzle propulsion and two Napier *Eland* propeller turbines.




*Handley Page Herald* feeder liner for 36 to 44 passengers. Two prototypes are under construction, one of which will be ready for flight testing in 1955. Four 870 h.p. Alvis *Leonides Major* two-row radials.

# Air Transport is in a Difficult Period of Transition

A summary
of the I. A.T. A. Meeting

Transport Minister J. Chaban-Delmas reading his address of welcome to the Tenth Annual General Meeting in the Hotel de La Rochefoucauld, Paris.

". . . Air transport is not vital for trade, life or commerce as a whole. It is a luxury . . . and luxuries ought to be paid for by those who enjoy them, and not by the taxpayers." ". . . From every standpoint the skimming of the cream of transport, in order to make luxury air speeds financially possible, is to be deprecated . . ."

These not over-friendly words come from a recent correspondence on "unfair subsidization" of air transport in "The Times" by Sir Donald Anderson, spokesman for British shipping interests, Mr. Ernest Short, former Secretary of the British Railway Stockholders Union, and others.

As was to be expected, Sir William P. Hildred, the alert Director General of the International Air Transport Association, did not let slip the opportunity for a reply. In his humorous way he reminded Sir Donald that the rivalry between sea and air can raise no claim to originality. Every age has produced its new form of transport, which has met bitter opposition from existing forms. In 1672, for example, when the stage coach was displacing the pack horse on the roads of England, a certain Mr. Cresset said, "those coaches and those caravans are one of the greatest mischiefs which have happened to our kingdom, destroying the breed of good horses, the strength of the nation, and making men careless of good horsemanship, hindering the breed of watermen, the nursery for seamen, and the bulwark of our nation." — Moreover, adds Hildred dryly, the very shipping lines that are today intoning this tale of woe have themselves accepted "decades of honourable subsidization." —Others joined the debate, and the subject was thoroughly ventilated . . .

Max Hymans, President of Air France, I.A.T.A. President for 1954-55 (left) congratulates P.A.A. President Juan Terry Trippe (right) on his election as I.A.T.A. President for 1955-56. Centre: Sir William P. Hildred, I.A.T.A. Director-General.

This correspondence is in no way foreign to the theme of the present article. On the contrary, it leads direct to the burning questions which confronted I.A.T.A.'s 10th Annual General Meeting in Paris: What is the present economic situation in air transport? Is air transport on the way to taking its place as a fully-fledged transport branch? Are today's operating methods satisfactory, or do they need improving? Should air transport follow unreservedly the headlong tempo of engineering progress, or should it apply the brakes?

### The Committee reports

However important the personal contact between airline heads at these general meetings may be, the decisive work is naturally done by the specialized committees—Executive, Technical, Legal, Financial, Traffic—whose reports

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## Personalities draw

**There was really nothing to do but dip, with the courage of despair, into the sweepstake drum and fish out suitable names to go with the photographs of prominent personalities. If the name should not always fit the picture, complaints should be addressed—in the following order—to: the usher at the General Meeting who mixed up the black name plates of the various airlines; the delegates who sat in the "wrong" places; the press photographer who forgot to mark his pictures; and Interavia's Paris office, which is responsible for the whole thing . . . Letters to the photo editor will have not much effect; he is going on leave. Editors**

*Britain and America side by side.* Left to right, Lord Douglas of Kirtleside, Chairman of the Board of B.E.A.; Sir Miles Thomas, Chairman of the Board of B.O.A.C.; F. Jones (Braniff); B.T. Dykes (Colonial); L. G. del Portillo (Cubana).

*Yes, he was there...* Between D.Campbell of Panagra (far right) and Sir Hudson Fysh of Qantas (second from right) on the opening day: Per A.Norlin (second row with headphones), retiring President of S.A.S. Some know-alls maintained he had not gone to Paris. Left of Norlin: W. P. A. Deswarte (Sabena).

*Observers from international organizations:* left to right, Dr. E. Warner, Chairman of the International Civil Aviation Organization; L. Delanney (United Nations); H. H. Robinson (I.C.C.T.A.)

reflect I.A.T.A.'s patient detail work during the past year.

Central place is usually taken here by the reports of the Traffic Conferences, which lay down the economic programme for world air transport and regulate rates, capacity and service.

The experience and recommendations of the 1953 Traffic Conferences served as preparation for the Conference which opened in Venice on September 28th, 1954, under the chairmanship of Michel de Villeneuve, Air France Commercial Director, and whose task is to determine rates and conditions of carriage for 1955.

The year 1953 as a whole was characterized by the "growing pains" which Max Hymans, I.A.T.A. President for 1954—55, described in his closing address:

"The situation is that of a world-wide transport system which is still in the process of expansion. The airlines are still seeking the refinement of power plants, equipment and facilities which will increase their reliability and their earning power, and to develop the great mass markets where they feel their real opportunity to serve the public lies... The industry is in a period of transition and development, and periods such as these are always difficult. I believe it is safe to say that the airlines do not wish to raise their charges to the public, and that they would like to be as independent as possible of government subsidy or support. It is also proper to point out, however, that the costs of the ingredients of the air service they provide have been getting dearer, that there has been a tendency on the part of governments to make it more expensive for them to do business and to allow them less opportunity to accumulate the reserves they need to develop better services for the public."

### Traffic Conferences and Traffic Advisory Committee

The work of the Traffic Conferences during the past year, like the Traffic Advisory Committee's report, turned on the following central problems: expansion of air cargo traffic, establishment of more adequate standards for tourist class service, simplification of the rates structure, currency fluctuations and transfer difficulties, penalties for seat reservations not used.

On the subject of *air cargo,* Ray W. Ireland of United Air Lines, Chairman of the Honolulu Traffic Conference, particularly welcomed in his report the fact that agreement had been reached on Atlantic cargo rates, since it had at first seemed as if the differences in approach to the problem were irreconcilable. However, he warned, the agreement did not mean that "the airlines found out all there was to know about cargo ... Carriers do not yet possess a sufficiently refined knowledge of the cargo market in deciding the best method of launching a campaign for volume cargo."

The same view was expressed in the report of the *Traffic Advisory Committee presented by John W. S. Brancker.* There are two basic philosophies among the airlines on the subject of cargo development, "one which believes that a general lowering of rates for bulk consignments will attract the greatest market, and the other which believes that the best economic results, together with expansion, can be obtained by the extensive use of special rates for specified commodities." Practical solutions would have to be found by the Traffic Conferences, though there seemed to be a good case for forming a small body of experts to study the long-term aspects of the problem and work out a sensible policy in a quieter atmosphere.

*Interavia* particularly welcomes this realistic approach since it has repeatedly called attention to the need for improving present air cargo arrangements. For example, as pointed out in No. 2, 1954 ("I'm not Afraid to Fly"), there is room for much closer cooperation in cases where freight has to be carried by a number of airlines in succession, so as not to discourage the public by unnecessary delays and errors.

*

Turning to *passenger transport,* it might be thought that this branch of the business—the oldest—would by now have achieved a solid basis. However, on closer inspection it is found that, though the world-wide introduction of tourist-class services has provided a valuable stimulus to transport, many airlines are encountering difficulty in solving problems of seating and differences in meals and other service for first and tourist-class passengers. Other problems are raised, adds the Ireland report, by the "mixed" aircraft which carries both classes, and which some carriers regard as essential. The Traffic Conferences have, however, prepared regulations to prevent abuses, which it is hoped will be accepted in Venice.

A more difficult question than those of organizational details is presented by the somewhat

French Transport Minister Chaban-Delmas received delegates to the Tenth Annual General Meeting in the Palace of Versailles.

Right to left: L. Duncan (Cruzeiro do Sul), Sabena President G. Périer (half hidden by Duncan), Major General C. J. Venter (South African Airways), General Fayet (T.A.I.), Gordon McGregor (T.C.A.)

*Sustaining interlude:* left to right, M. Guyot (U.A.T.); further back Ray W. Ireland (U.A.L.); Warren Lee Pierson (T.W.A., deep in thought); Gordon McGregor, (Trans-Canada).

Far left: J. Viniegra (Iberia). Next to him representatives of U.I.C. and I.C.P.C.

chaotic conditions in rates and fares. "It is a pity," the report says, "that we deny ourselves the full benefits of the new markets we have created by saddling our sales organizations with a hopelessly complicated fares structure. We are fully aware of the short-comings; but as yet the Conferences have not found a solution."

Finally, Mr. Ireland hoped that the Venice conference would find an answer to the serious problem of seats booked but not used at the last moment. A solution is urgently needed, since the financial consequences to the airlines are grave. In the United States and Canada, where penalty charges are made when passengers fail to cancel reservations in good time, it is estimated that carriers still lose something like $60,000,000 a year on empty seats. In Europe, where penalties were introduced but then dropped, the number of "no-shows" increased from 1.1 % to 5.7 %.

I.A.T.A. session in the Hotel de La Rochefoucauld.

Another urgent problem is that of *coordinating military and civil flying in Europe*. Here the difficulties experienced have no direct effect on airline finances, but do hinder the smooth working of commercial operations. The problem occupies considerable space in the final resolutions passed by the Tenth Annual General Meeting, and the International Civil Aviation Organization is urged to press governments to reduce military restricted areas to the essential minimum.

### Recommendations of the Technical Committee

While the report on the Traffic Conferences showed that, economically speaking, world air transport is still far from "stream-lined," the work of the Technical Committee—chairman Paul W. Goldsborough, Trans World Airway's General Manager of Communications—indicates even more clearly that the industry is still deep in a transition stage.

This applies most strikingly to the field of *navigation aids*, where the mosaic of different methods and systems is still very confusing. In the Technical Committee's view, the airlines can expect national authorities to improve their navigation installations only if they themselves accept severe limitations in the number of systems used. I.A.T.A. therefore urges all airlines to rationalize their airborne radio equipment and to carry out the conversion from older to newer navigation systems to a uniform plan. The committee stressed that in certain conditions it would technically and economically be better for the companies to acquire new airborne equipment as soon as possible.—If one airline is too slow to discard an out-dated system, this may create serious problems for all other airlines, since most countries cannot maintain two different radio navigation systems on the same route.

*

*Problems of European air transport:* I.A.T.A.'s efforts to introduce the VOR system in Europe and to integrate it with the existing system of MF beacons have now produced the first positive results. A number of VOR installations are already in operation, and additional countries are planning the erection of the system and engaged in discussions with the airlines or with I.A.T.A.

There are, however, three long-standing problems in European air transport that have not yet been solved: more efficient radiotelephony, coordination of civil and military air operations, and standardization of altimeter setting procedures.

Though radiotelephony is coming into increasingly widespread use in both commercial and military aviation, the present system is not adequate. Another thorny problem is the lack of a uniform altimeter setting system, which now varies from country to country. A standard system was worked out last year by I.C.A.O., but some countries have been unable to accept these recommendations, and the old lack of uniformity persists.

*

*Fuels for turbine engines:* The search for ideal fuels for jet and turboprop aircraft is making good progress, and I.A.T.A.'s Turbine Fuel Working Group has received encouraging response from airlines, fuel companies and aircraft and engine manufacturers.

The "ideal" fuel must be one "which would have the lowest possible cost consistent with other requirements; be no less safe than kerosene; be generally available at the airports of the world; ensure reliable and economic engine

Fourth from left, under lamp: Prince Pacelli (President of L.A.I.); right of him, K.L.M. President I.A.Aler and a representative of Japan Air Lines.

Right to left: C. N. Biondi (Philippine Air Lines); representative of L.O.T., the Polish airline; D. Campbell (Panagra); Sir Hudson Fysh (Q.E.A.).

Right to left: G. Bertoli (Air India), B. Meguerdiche (Air Liban), Cappelletti and Count Carandini (Alitalia), J. de Brigard (Avianca), Wolfe (CGTAAA).

# *Versailles to the Bois de Boulogne*

I.A.T.A.'s Annual General Meetings consist, of course, of a number of working sessions. But there is also a public opening session and closing session, more or less in the grand style, and a whole series of receptions at which the host country and airlines entertain their guests from abroad.

The Tenth Meeting was no exception to the rule. After the opening session presided over by M. Jacques Chaban-Delmas, Minister of Public Works, Transport and Reconstruction, delegates attended a cocktail party given by the Municipal authorities. They were received by the Council's Chairman Bernard Lafay in the drawing rooms of the Hotel de Ville, and signed the Golden Book of the City of Paris, which already contains so many famous names.

The next day delegates were invited to a dinner organized by M. Chaban-Delmas in the imposing **Galerie des Batailles** in the Palace of Versailles, a dinner followed by a magnificent, but somewhat "cooling" spectacle entitled "Sound and light." Indeed the damp night air of the gardens was a little too much for the guests' evening dress.

To every day its party. That on Wednesday was given by the **Union Syndicale des Industries Aéronautiques** (Association of French Aircraft Manufacturers). After a visit to the Palace of Chantilly, a cold buffet was served in the Duc d'Aumale's stables, which date from the time when horses were housed better than men. Then delegates watched, unfortunately in the rain, a horse show, the triumphant winner of which was a girl of 12, daughter of M. Simmonet, Secretary General of SNCASO.

Finally, the evening before the closing session the host companies — Air France, Aigle Azur, C.G.T.A. Air Algérie, T.A.I. and U.A.T. — gave a dinner dance at the Pré-Catelan, a very gay affair which lasted until dawn.

The dinner given by French Transport Minister Chaban-Delmas in the *Galerie des Batailles*, Palace of Versailles.

Leading personalities at the U.S.I.A. banquet at Chantilly: (left to right): M. Guilbot (U.S.I.A.); M. Gandilhon (Bréguet); M. Heurteux (Hispano Suiza). *Right:* Robert Blum (Hispano Suiza), Louis Bréguet.

The Association of French Aircraft Manufacturers (U.S.I.A.) entertained delegates to I.A.T.A.'s Tenth Annual General Meeting at Chantilly.

operation . . . under all conditions applicable to civil air operations; and have as high a heat content per gallon as practicable."

The Technical Committee is now working out a specification for a cheap turbine fuel which airlines could use in common with other consumers, thus spreading taxation costs. Once this is found, manufacturers could design suitable engines and aircraft. Without it, fuel costs threaten to account for an even higher proportion of operating costs than piston engines have done hitherto.

•

*Helicopters:* The Committee points out that the development of helicopters for regular trans-

(Continued on page 761)

*"Big guns" from the United States:* second from left: W. A. Patterson (President, United Air Lines); on his right, W. L. Pierson (Board Chairman, T.W.A.); representative of Portuguese T.A.P.; far left, representative of U.A.T., one of the French hosts.

Second from left, M. Guyot (U.A.T.); on his right, Ray W. Ireland (U.A.L.); W. L. Pierson (T.W.A.).

Right to left: representative of the Greek flag carrier T.A.E.; representative of North West Airlines; R. Wieland (National Airlines); with cigarette, Sir Leonard Isitt (T.E.A.L.)

# Development of World Air Transport since 1939

The following table shows the development of air transport during the past fifteen years. Though much more rapid than in the fifteen years between 1924 and 1939, its growth has not been fully appreciated by the layman, since it has been gradual. Mainsprings have been the technical progress of the war years and world transport needs since the war.

## Operating performance

| 1939 | 1954 |
|---|---|
| — Total world network was approx. 280,000 miles. | — The last 15 years have more than doubled the world network, which now exceeds 620,000 miles. |
| — Roughly 1,980 aircraft were in service on regular routes. | — The fleet now operating scheduled services is roughly 2,800 aircraft. |
| — These 1,980 aircraft covered an annual distance of approx. 190,000,000 miles. (Distance between earth and sun, 93,005,000 miles.) | — In 15 years this performance has multiplied more than six times. Total estimated distance for 1954 is 1,200,000,000 miles. |
| — Air carriers recorded roughly 4,500,000 passengers. | — Total number of passengers in 1954 will probably exceed 54,000,000 (a more than ten-fold increase). |
| — Roughly 30,000 tons of mail and 45,000 tons of express goods went by air. Air cargo business was merely beginning. | — Since then air cargo has grown out of all recognition. Total performance today is more than 800,000,000 ton-miles. Airmail in 1954 is estimated at an additional 190,000,000 ton-miles. |
| — World air transport performed about 1,000,000,000 passenger-miles. | — 1954 figures will be 30 times as high; roughly 30,000,000,000 passenger-miles. |
| — Every passenger flew an average distance of 370 miles. | — On an average each passenger now covers a distance of 550 miles. |
| — On an average each scheduled aircraft carried seven passengers. | — With the increased dimensions of airlines this figure has risen to an average of 27 passengers per aircraft. |

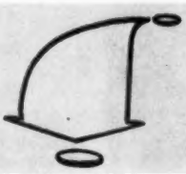
## 1939

— Between Paris and London there were 14 daily flights offering a total of 270 passenger seats.

## 1954

— Today Paris and London are connected by 22 services a day; around 1,000 travellers fly on this route in 24 hours.

— Between New York and Washington there were 24 regular services a day; total seats offered about 490.



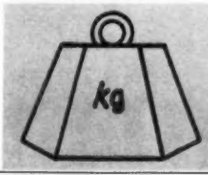
— There are now 50 regular services a day between New York and Washington, with 2,500 to 3,000 seats.

## Flying equipment

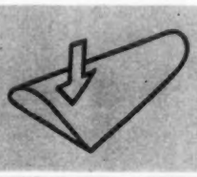
● — The following were typical aircraft of the 1939 period: Junkers Ju 52, Boeing 247, Dewoitine 338, Savoia 75, Short **Empire** flying boats, Fokker **VII**, Lockheed 14 and Douglas DC-3. The following average figures are based on these aircraft types.

● — Average figures for 1954 are obtained from the following aircraft types: Douglas DC-4, DC-6B, Lockheed L-1049E **Super Constellation**, Boeing **Stratocruiser**, Convair Liner, Vickers **Viscount 700** and Douglas DC-3.

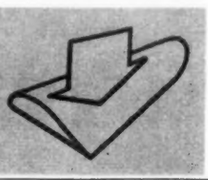
— Average take-off weight was 23,400 lbs. . . .




— Average take-off weight is 83,400 lbs. . .

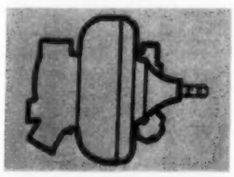


— . . . wing loading was between 16 and 28 lbs./sq. in.

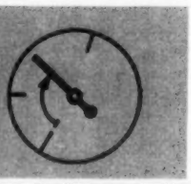


— . . . wing loading varies between 56 and 80 lbs./sq. in.

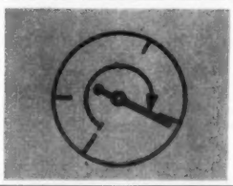
— Take-off power (average of above-mentioned types) was about 2,000 h.p.



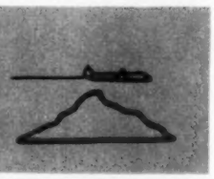
— Today's modern airliners have four times as much take-off power: mean of above-mentioned types 7,800 h.p.



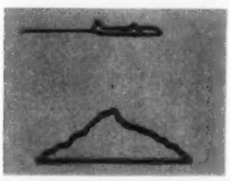
— Average cruising speed was less than 150 m.p.h.



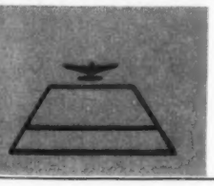
— Average cruising speed is about 250 m.p.h.



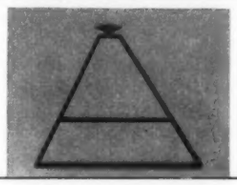
— Average cruising altitude (no pressure cabins) was less than 10,000 ft.



— Thanks to pressure cabins, average cruising altitude is now nearly 18,000 ft.



— Airliners of those days had a take-off run of about 500 yds. and managed with a runway some 1,000 yds. long.



— Modern airliners have a take-off run of approx. 1,000 yds., and need a runway length of 1,800 yds.

# One plus four

*The usual practice is for the airline whose head has been chosen to preside over the I.A.T.A. Annual General Meeting to undertake the whole organization, but in Paris a slight change was introduced. The national flag carrier Air France invited the "big four" French private operators — C.G.T.A. Air Algérie, Aigle Azur, T.A.I. and U.A.T., all I.A.T.A. members — to assist in the organization.*

*Following is a brief note on these five companies.*

## AIR FRANCE

Air France operates throughout the world. Its fleet of 133 aircraft, including **Constellations** and **Super Constellations, Viscounts,** Bréguet **Deux Ponts,** DC-4s and DC-3s (with 9 more **Super Constellations** on order), flies a route network of over 170,000 miles, the longest in the world.

M. Max Hymans, President and Managing Director, has assembled around him a particularly competent staff: M. Briend, Assistant Managing Director, M. Lemoine, Secretary General, M. Dupré, Technical Director, M. Montarnal, Financial Director, and so on.

*Max Hymans*, President of Air France.

*Jean Richard-Deshais*, President of C.G.T.A. Air Algérie.

## COMPAGNIE GENERALE DE TRANSPORT AERIEN AIR ALGERIE

C.G.T.A. Air Algérie, formed by the merger of Air Algérie and Air Transport, specializes in services between France and Algeria. Its fleet of DC-4s and DC-6Bs (two more of the latter on order) crosses the Mediterranean 3,000 times a year, carrying more than 100,000 passengers. Its President Jean Richard-Deshais, a pioneer of transport in all its forms, is assisted by Colonel Jacques Soufflet, who was one of the aces of the Free French Air Force.

## AIGLE AZUR

With its two DC-6s (one more on order) and five Boeing **Stratoliners,** Aigle Azur operates two major services in the French Union, Paris–Saïgon via Beirut, and Paris–Antananarivo via Djibuti. Its subsidiary, Aigle Azur Indochine, with a fleet of DC-3s, Bristol 170s and one D. H. **Beaver,** has done valiant service in Indo-China, in particular on the Hanoi–Saïgon airlift. The company's President is M. Sylvain Floirat, who is assisted by Mm. Klein, Bizone and Danguy.

*Sylvain Floirat*, President of Aigle Azur.

*Paul Bernard*, President of T.A.I.

## COMPAGNIE DE TRANSPORTS AERIENS INTERCONTINENTAUX (T.A.I.)

Compagnie de Transports Aériens Intercontinentaux, known more familiarly as T.A.I., operates on five main routes: France–Morocco, France–French West Africa, France–French Equatorial Africa, France–Madagascar and France–Indo-China. It has a fleet of three DC-6Bs (two more on order) and three DC-4s. President is M. Paul Bernard, the well-known financier. His staff consists of General Fayet, Managing Director, and Vilmot Roussel, Assistant Managing Director, Mm. Mathieu, Secretary General, Serraz and Caffié.

## UNION AEROMARITIME DE TRANSPORT (U.A.T.)

The "Aéromaritime" part of U.A.T.'s name recalls the close bonds which unite it with Chargeurs Réunis, the powerful shipping company which has been operating to the ports of French West Africa and French Equatorial Africa for nearly a century. U.A.T. has therefore naturally concentrated its activities on the same regions, operating from the mainland of France with four DC-6s and one DC-4. It also runs a number of services inside central Africa with a fleet of nine four-engined D. H. **Herons.** Finally, the only French private operator to do so, U.A.T. runs an international service, between France and South Africa.

President of Union Aéromaritime de Transport is M. Louis Vidal. His chief directors are Mm. Loubry and Combard, formerly of Air France's flying personnel. Two more of M. Vidal's assistants, Mm. Guillot and Jalaber, are well known to I.A.T.A. delegates, who may be interested to hear that M. Jalaber has just left U.A.T. and returned to Chargeurs Réunis, to become manager of the latter's New York agency.

*Louis Vidal*, President of U.A.T.

Right to left: Cyprus Airways Ltd.; Delta C. & S.; A. H. Pinho da Cunha (DETA); J. da Silva Medina (DTA); N.A.A.C.

Right to left: J. R. D. Tata (Air India), Count Carandini (Alitalia), de Brigard and Uricoechea (Avianca), Wolfe (Air Algérie).

Right to left: Danguy (Aigle Azur), R. Briend (Air France), J. R. D. Tata (Air India), Air Liban.

port operations is advancing more rapidly than the provision of suitable ground installations and regulations for their operation. At present, helicopters are limited by their high operating costs in relation to payload, and commercially profitable helicopters are still in the development stage. I.A.T.A. is working out flight rules for helicopters, whose requirements as regards air traffic control, communications, meteorology, navigation, personnel licensing etc. may differ from those of conventional aircraft.

*

*Future projects:* In a brief review of future problems the Committee stressed the importance of future operational requirements for long distance navigation, particularly over the North Atlantic.

In addition, weather minima for take-off and landing must be still further reduced. Whether regularity can be improved by the development of fully automatic landing systems can only be revealed by further research and investigation. Cooperation between airlines in the overhaul and maintenance of flying equipment, ground installations, spares, etc. also requires investigation. In view of the large amount of passenger handling, servicing and maintenance equipment which airlines are obliged to maintain at the various airports, such cooperation would bring valuable economic advantages.

### Legal Committee

As a private association of airlines, I.A.T.A. is necessarily restricted to a more or less advisory role in the development of international air law and in the drafting of basic international conventions. Draft agreements are the responsibility of the International Civil Aviation Organization, which represents the governments. This does not mean, however, that I.A.T.A.'s Legal Committee is merely an onlooker. The reports presented by the Committee's Chairman, René Golstein (Sabena), and Sune Wetter (S.A.S.) show that I.A.T.A.'s legal experts are quite capable of impressing their point of view on I.C.A.O. and the national aviation authorities and do in fact have considerable influence on the formulation of agreements.

The following is a condensed summary of the subjects discussed by the Legal Committee:

*Aerial collisions:* Though "mercifully, there have been very few collisions between aircraft in flight," the Committee supports a draft convention under preparation by I.C.A.O. on liability for damage arising out of aerial collisions. Such an international agreement will fill a gap in the regulation of air carriers' liabilities and make it easier for airlines to get proper insurance coverage. The Committee also recommends that the convention be extended to cover two other types of case: collisions over the high seas, and collisions between aircraft of two countries adhering to the convention over the territory of a third country not a party to it.

*

*Revision of the Warsaw Convention:* I.A.T.A. considers that a full revision of the 1928 Warsaw Convention on the liabilities and rights of air carriers in regard to passengers and freight consignors would be "premature." The Committee fears that an attempt at general revision might lead certain States to denounce the complete Convention.

This argument may well be an important one, but it would seem justified to ask whether the real interests of air transport will be served by clinging to liability limits fixed twenty-seven years ago, which no longer correspond to conditions today. Fear of "ruinous compensation demands" is not a good counsellor when the need is to inspire the public with confidence in the safety of air transport. Shipping and railways pay up.

*

*Negotiable air waybills:* The suggestion that air waybills—like shipping waybills—should be made negotiable so that they might be considered as adequate security for loans has not aroused much enthusiasm among airlines' traffic and sales organizations. I.A.T.A.'s Legal Committee therefore expressed the hope that I.C.A.O. would not take final steps in this direction "unless the need for it is sufficiently demonstrated by shippers, bankers and others concerned."

*

*Carriage of cargo by several airlines successively:* The Committee has completed a draft agreement on interline cargo claims procedures. If accepted, this agreement "will mark a further milestone on the road toward efficient uniform arrangements for international interline air carriage."

### Financial Committee

The report which Basil Smallpeice (B.O.A.C.), Chairman of the Financial Committee, submitted to the Annual General Meeting was able to announce successful operations on all fronts.

The *I.A.T.A. Clearing House* in London, established in 1947 to overcome currency transfer difficulties by offsetting credit and debit balances between the various airlines, has already reached a total turnover of over $1,000,000,000. The Committee adds that business is growing at such a rate—47 I.A.T.A. companies now utilize the service—that it expects the $2,000,000,000 mark to be passed before the end of 1956.

Good progress has been made in obtaining more liberal conditions for transfer of payments involving a number of European currencies as a result of *negotiations with the Organization for European Economic Cooperation.*

At the suggestion of the Financial Committee, European and American airlines have experimentally introduced *new accounting methods* aimed at saving time and money. In future only random samples of ticket coupons and other documents will be subject to close checks.

The only shadow on the picture is the tendency of countries on both sides of the Atlantic to impose higher and higher *taxes and charges* on air transport. So far all protests by I.A.T.A. against excessive sales taxes, airport and air traffic control charges have been vain.—A new Taxation Sub-Committee has been formed to work on this problem, in close contact with I.C.A.O.

These young women—the sign "Vestiaire" (cloakroom) above their heads is misleading—did not handle hats and coats, but distributed tons of I.A.T.A. printed matter (all documents for the General Meeting were prepared in English, French and Spanish).

*

The above resumé is an attempt to depict the measure of work accomplished by I.A.T.A. each year.

Air transport is passing through a difficult transition period, and its economic outlook for the coming months does not seem rosy. However, its difficulties would be very much graver if the airlines were not backed by a well-organized association which can jump into the breach when needed and ward off the bitterest blows.

"This General Meeting," said Max Hymans in his closing speech, "has served to strengthen the bonds of common interest between the airlines, and to emphasize the fact that no matter where their head offices lie, or where they operate their routes, the problems of air transport are truly universal—and their solutions are to be found only through the cooperative action of all those who engage in it."

The autor interviewing a street-car driver.

# The Men of Rail, Road and Air

BY MARCEL DE CARLINI, GENEVA

**Airline publicity, enterprising as it is, is generally restricted to newspaper articles, news bulletins, illustrated booklets and the like, and it is rare for it to use the spoken word. It is therefore gratifying to find a relatively small broadcasting station, Radio Geneva, organizing a regular weekly transport programme entitled "Le rail, la route, les ailes" (Road, rail and air), which keeps listeners in touch with transport developments in general. The following article shows what Marcel de Carlini, who presents this programme, considers to be effective transport publicity . . . His sketch outlines a kind of "psychology of transport."**

**Editors**

I have known them for more than twenty years. But little did I dream when, as an agent for a Moroccan transport company, I travelled the dusty tracks from the Atlas to the borders of the Sahara in the cab of truck or bus, or drank with the French military pilots stationed in the lonely villages where we stopped to rest, that one day I should be talking about them on the radio. How many useful notes I could have taken . . .

Yet when Radio Geneva asked me to organize a regular broadcast on the various means of transport (*Le rail, la route, les ailes*) I soon found myself on familiar ground. Transport people, whether engine drivers, bus or truck drivers, or aircraft pilots, have an *esprit de corps*, a language and a turn of mind which make of them one big family. This reminds me of a typical example I once came across at Touggourt, where I landed from an Air France DC-4. The company's agents in this desert city are a ground transport firm. I interviewed the old man who ran it, a typical Frenchman, tanned by sun and sand. He told me, with a casual air:

"Sixty years ago I used to send out camel caravans to the Sahara oases. When my son took over—it was when they were building the Biskra-Touggourt railway—he bought trucks and used those on the southern routes. The drivers covered thousands of miles on a single trip, camping in the desert at night, like the camel drivers of old. Today my grandson is in France, flying a jet aircraft! My camels used to do about 2½ miles an hour, while he streaks through the air at the speed of sound."

One could write a book on it: "From the Desert Ship to the *Mystère IV*."

Perhaps, one day, I will . . .

Meanwhile my job is to present the men of rail, road and air to my listeners each week. It is not always easy. There is first the technical side, though this is not the most serious problem. The most difficult part of the job is making contact. When you approach the driver of an Alpine bus, the engineer of the Paris-Dijon express or the pilot of the aircraft about to take off for New York, you need your wits about you. They sum you up at your first question. If it is stupid or frivolous they will tell you nothing—or spin you a yarn.

Some of them are tough characters. There was one truck driver in Morocco who used to carry clandestine—but paying—passengers in his five-tonner, in defiance of strict orders from the police and his employers. One day when he had half a dozen hidden in the back, he suddenly saw, far ahead, the silver stripes of two policemen glinting in the sunlight. Without a second's hesitation he crouched down in his cab, managing (heaven knows how) to maintain speed and direction, and the truck went careering past the dumb-founded policemen, to all appearances with no-one steering it. From that time on the driver (who looked just like Jean Gabin) was nicknamed the "ghost driver."

But the same driver, after fourteen hours at the wheel, unhesitatingly set off again two hours later on the same route, to replace a comrade who was sick. The job, too, was not without its dangers. I remember trips in troubled areas where legionnaires travelled in armoured cars on either side of the track to protect the convoy from rebel attacks. One day one of our trucks was attacked in a region believed to be peaceful, its contents looted and the two drivers killed. I accompanied their coffins to the church in Marrakesh and then to the cemetery where they rest in the shadow of the palm trees . . .

Once one has gained the confidence of the "transport lads," one sometimes receives quite unexpected observations. I remember once riding on the platform of a French Railways electric locomotive between Paris and Dijon, doing nearly 90 m.p.h. (not much for an aircraft, but quite respectable for a 600-ton train). At first we discussed technical points.

"The speed is no trouble," said the engineer, "you only have to keep your eye on the signals . . ."

(I had been trying to watch the signals myself, but missed at least five out of every six . . .)

". . . what is more difficult is when they send you, at 90 m.p.h., on the right-hand track. You see, we're used to driving on the left, and we don't feel really comfortable on the 'wrong' side: keep imagining we shall meet another train head on . . ."

I asked him whether he preferred electricity to steam, and he gave me the following rather unexpected reply.

"Of course, it's cleaner in here. But you're so caged in. When you leaned out of the old steam locomotive at night going through the forest of Fontainebleau, the scent of the trees came up in waves, right into your face . . ."

And his rugged face had an expression almost of nostalgia.

The cinema has already familiarized the scene of the first meeting between Mermoz and Didier Daurat, in front of the sheds at Toulouse where the old Aéropostale was born, and Didier Daurat's statement, "We need pilots, not acrobats." One of the pilots of that heroic age once confided in me:

"One day I made a bet that I would write my name with my aeroplane on the Bay of Biscay. My aeroplane, mind you—not a seaplane. I did it, but it was a stupid thing to do . . . I was risking my aircraft and perhaps even my own skin . . ."

Today he is the boss of a large airline. He smiled as he recalled this episode from his youth. But he was no longer smiling when he said:

'When is he going to let me take off?" – The airline pilot.

"Tell your listeners that commercial air services today are not a form of sport where the crew are out for 'stunts,' but a serious means of transport and must be performed with safety and regularity."

How true this is I was able to see for myself on a trip I made by DC-6 from Geneva to Buenos Aires. At every stop I accompanied the crew to the met. office, watched them bend over the sheet of paper handed to them by the met, official. The captain pointed to the map: "I'll take this route." No, they were after no records. They had the same look as the Paris-Dijon engineer watching his signals to the left of the track . . . clear and trustworthy.

This is why I deplore the way certain newspapers write up air accidents. Sensationalism leads nowhere. Or rather it sometimes leads to a *gaffe*. One press agency recently announced, for example, that the passengers of a *Constellation* in difficulties had bailed out by parachute . . . I organized a little "Gallup poll" of my own. I asked ordinary people who had read the announcement what they thought of it. They all said they had at first been a little surprised, but after this first reaction they were ready to believe that perhaps, after all, it might be possible.

But when I showed it to my son Michel, aged 11, he said without hesitation: "How silly! They ought to know there are no parachutes in civil airliners!"

The young are the best clients of aviation books and magazines. Their fathers were still playing with toy trains, but they have advanced to jet aircraft and even interplanetary travel.

To return to the subject of accidents, whenever I am questioned by a reader who has been scared by screaming headlines and horrific details, I tell him of the "working day" in the United States when 500 people were killed on the roads. I add that this is equivalent to the full complement of passengers and crews for ten *Constellations* and that on that particular day there was not a single aircraft accident anywhere in the world. He opens his eyes wide with astonishment and has to admit it is true.

"Nothing to declare..." – The truck driver.

"Am I on the right track?" – The locomotive driver.

The list of flying people I have interviewed is endless. There was, for example, the young parachutist Aubin who told me after a parachute demonstration at Neuchâtel, "The trickiest part is folding the parachute," and who was killed at a meeting in Germany a year later. Then, among the pioneers of the "heroic age," there was Durafour, who landed his second-hand contraption on Mont Blanc more than thirty years ago. And Bossoutrot, the first to fly from Paris to London, when aircraft had to fly so low over the Channel, he said, that they were splashed by the waves; Charpentier of Atlantic fame; and Didier Daurat who was so charming to the representative of Radio Geneva.

Men whom I am proud to have interviewed and with whom it is always a pleasure to talk . . . even without a microphone.

*The rising generation:*
Half the kids of Tokyo were there to watch Keio University's first glider take off.

# The Chrysanthemum is only in Bud

## JAPANESE AVIATION IN 1954

Even the most friendly observer must admit that Japan's economic position is still far from brilliant. How could it be, less than ten years after a war which cost her 1,800,000 dead, deprived her of her overseas possessions and almost entirely cut her off from the world's markets? Yoshida's Government is struggling with succeeding currency and financial crises. The end of the Korean fighting and the consequent 47 % cut in American orders, together with the outside world's stubborn refusal to open its markets to Japanese goods have put Japan's trade balance sharply into the red. In 1953 payments exceeded receipts by roughly $193,000,000, which reduced currency cover by 14 %. The corresponding deficit for the first half of 1954 was $177,000,000. If the slippage is not stopped, Japan must reach rock bottom within a few months.

•

*Paradoxically, however, this precarious situation may ultimately have a stimulating affect on Japanese aviation.* The threatened crisis has mobilized Washington, and Secretary of State Dulles announced early in September that extensive American aid will be forthcoming.

The United States may well feel safe in financing and reorganizing Japanese aviation, since there can be no fear of her air power becoming strong enough to threaten the Western world for a long time to come. Any unbiassed analysis shows Japanese post-war aviation to be scarcely yet in bud.

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*The aircraft industry,* true, is showing modest beginnings. In addition to American licences—which all Japan's larger firms have acquired, though so far hardly used—there are even timid attempts at original development. What is actually being produced, however, is quickly listed: *Mitsubishi Juko* is building Sikorsky helicopters (S-55) under licence; *Kawasaki* produces small piston engines and is shortly to deliver three KAL-2 communications aircraft (of which it is to make five a month) to the National Security Corps; *Japan Engine Co.* (Omija Fuji Kogyo) has developed an axial-compressor turbojet with a thrust of approximately 2,200 lbs. and is putting it into production; *Shin Nippon Kokoki* makes helicopters; *Shin Meiwa* is working on a light jet trainer.

This activity, needless to say, will not keep an industry alive, and the Japanese aircraft industry continues to rely on maintenance and overhaul contracts from the U.S. Far East Air Force to keep its head above water. This emerges clearly from the figures published in September 1954 by the Japanese Aircraft Industry Association: in the period November 1952 to March 1954 the industry's receipts were as follows:

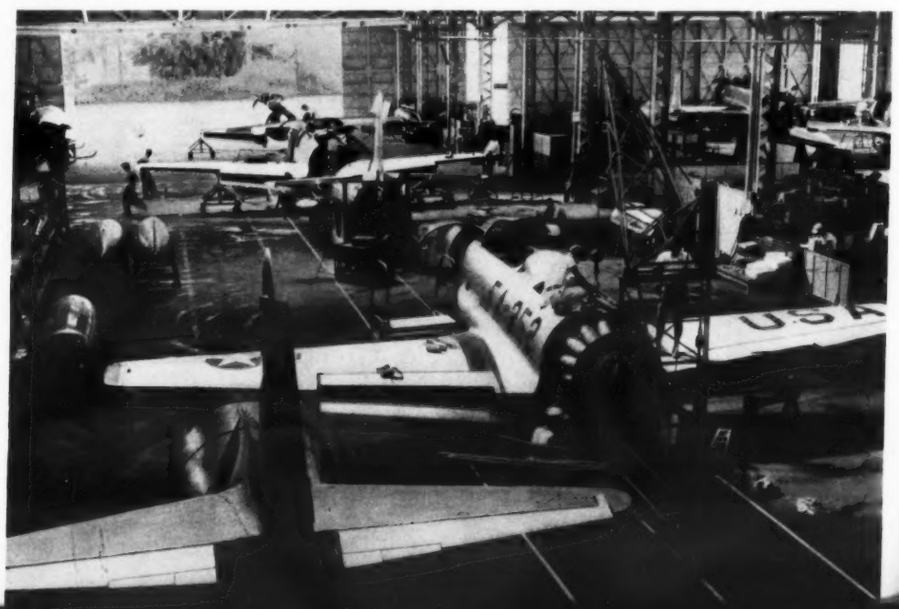
| | |
|---|---|
| Aircraft production | 152,935,000 yen |
| Helicopter production | 53,401,000 yen |
| Engines and engine accessories | 1,355,000 yen |
| but . . . | |
| Spares | 2,514,601,000 yen |
| Overhaul and maintenance | 554,771,000 yen |

•

The *air transport situation* can be judged from the personnel position. At the end of the war

JAL booking office in Tokyo.

Main source of income for the Japanese aircraft industry is still maintenance and overhaul work for the U.S. Far East Air Force.



*Are the Japanese really interested in flying?* At the beginning of 1954 Japan Air Lines made the first flight on their Pacific route, now operated three times a week. Picture shows the reception accorded the Douglas DC-6B "City of Tokyo" on its arrival at Tokyo International Airport from San Francisco.

Training mechanics at Japan Aircraft Maintenance Society.

An original design by Kawasaki, the KAT-1 two-seat trainer and communication aircraft.

Japanese Air Force officer at Hamamatsu training base.

Japan had 4,800 trained commercial pilots and 7,200 navigators. Today only 38 Japanese hold commercial pilots' licences, to which must be added 51 foreigners. In 1953 roughly 45,000,000 yen were spent on the training of 41 pilots, 4 navigators and 6 flight engineers. In July 1954 a commercial flying school was opened at Miyazaki, Kyushu, which hopes to turn out a total of 20 pilots, 5 navigators and 16 flight mechanics by the end of the year.

It is therefore understandable that Japan Air Lines' 81 crew members should include 50 Americans. The 31 Japanese act merely as second pilots on domestic routes (18), navigators (8) and flight engineers (5).

Japan Air Lines' economic situation in recent months has been anything but rosy. At one time it became so critical that there was talk of suspending the Pacific services which had been opened at the beginning of 1954. The necessity for such a step was averted, thanks to Government intervention, and services from Tokyo to San Francisco were even increased from two to three a week. Application has also been made to the U.S. Civil Aeronautics Board for authorization to operate between Tokyo and Los Angeles. Nevertheless there is still much to be done before a solid economic operation is achieved.

*

Finally, as regards the *air forces* of the National Security Corps (defence forces), General Kentaro Uemura, Commander of the newly-created Air Force, announced a five-year plan, in June 1954, for 36 squadrons and around 800 aircraft:

15 squadrons of North American F-86F *Sabres* (375 jet fighters)
6 squadrons of North American F-86D *Sabres* (150 all-weather fighters)
3 squadrons of Lockheed RT-33s (54 reconnaissance aircraft)
6 squadrons of Douglas C-47s (96 twin-engined transports)
6 squadrons of Douglas B-66s (96 twin-jet light bombers)

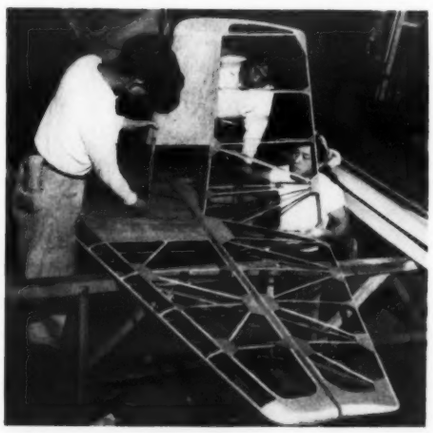
Total 36 squadrons Total 771 aircraft

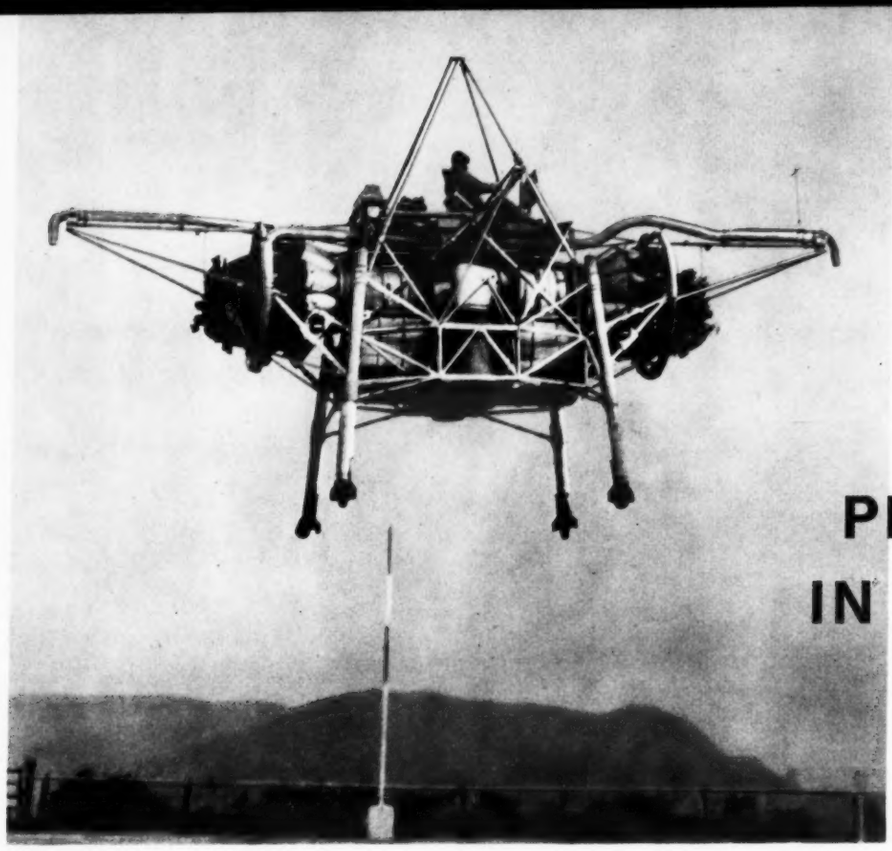
Transports, trainers and light communications aircraft will bring the total to some 1,300 aircraft. But all these are plans for the future. Today the Security Corps has only 50 light aircraft, and no satisfactory solution to the training problem has yet been found. In an interview in July 1954 General Uemura stated that 200 to 300 Japanese pilots would be trained at the U.S. Air Force's Far East bases during the 1954–1955 year, and another 100 will take courses in the United States. It is hoped to form the first jet fighter squadrons in May or June 1955.

In other words, all branches of post-war Japanese aviation are still in the earliest stages of development . . . The chrysanthemum is not yet in bloom.

Instructor and students at Hamamatsu base.

The gliding club (300 members) founded by students of Keio University, Tokyo, has built Japan's first post-war glider, the JA.0001 *Peace Plane*.





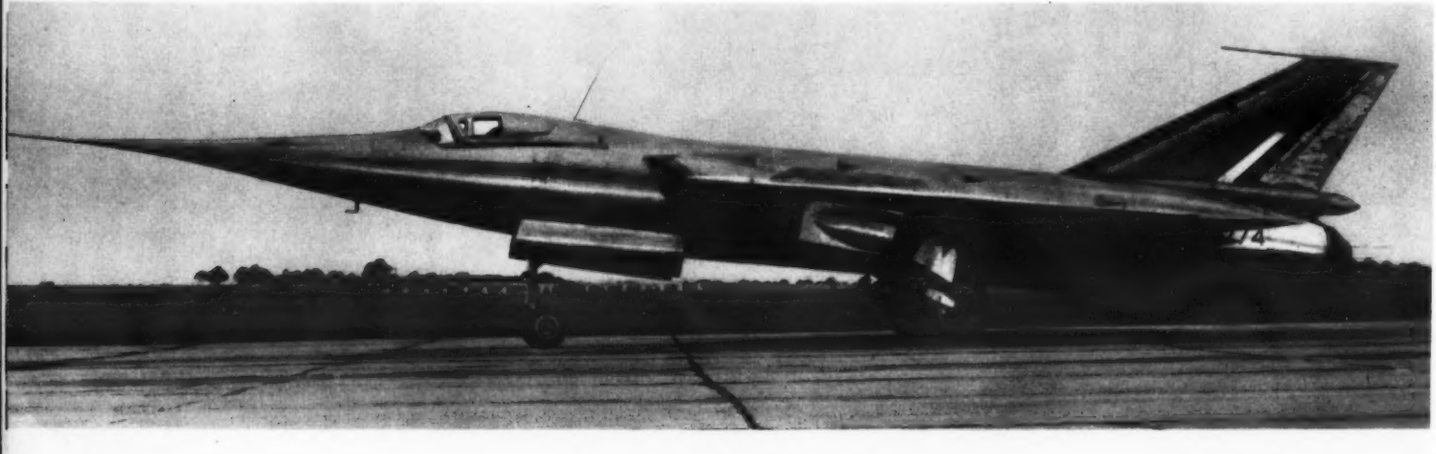
# PROGRESS IN PICTURES

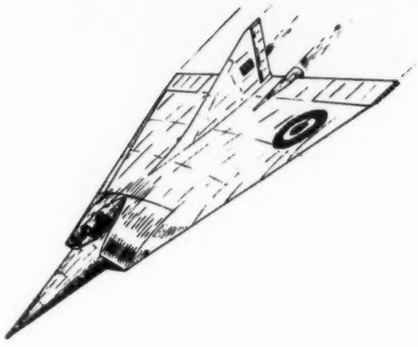
**The "Flying Bedstead"**

A wingless and rotorless test vehicle for vertical take-off developed by Rolls-Royce made its first free flight on August 3rd, 1954—after a number of tethered flights—and has since flown for periods of up to ten minutes. Nicknamed the "Flying Bedstead" by Minister of Supply Duncan Sandys, the vehicle was developed under a comprehensive experimental programme designed to investigate power requirement, controllability, stability, noise and heat, etc. with a jet thrust directed downwards. Main interest of the experiments is doubtless in connection with vertical take-off fighters.—The "Flying Bedstead" is propelled by two Rolls-Royce *Nenes*, mounted horizontally, with jet pipes deflected 90 ° downwards. This arrangement enables longitudinal moments to be balanced and compensates the centrifugal moments of compressor and turbine blades. Four compressed air nozzles on cruciform supports are used for load compensation and for steering "in flight." Compressed air is bled off the turbojets' compressors and transferred to the nozzles by the pilot, by means of conventional controls—joystick and foot pedals.

**Fairey supersonic delta aircraft**

For some time past there has been talk that Fairey Aviation Co. Ltd. was working on a successor to the small FD. 1 experimental delta. The first flight of the *Fairey Delta 2* has now been announced to confirm these rumours.—The makers state that the single-seat FD. 2, fitted with a Rolls-Royce *Avon* (with afterburner?), will be used for experiments in the transonic and supersonic range. Results will be used in the development of future military types, particularly supersonic bombers, and—much later—possibly in the design of supersonic commercial transports. Structural details available are sparse: long fuselage with very pointed nose; strikingly thin delta wing; main undercarriage units retract into wing, despite thinness of latter; nose wheel developed by Fairey; no elevator unit separate from wing. A further feature is that the fuselage nose can be "drooped" during take-off, landing and taxying, to improve visibility for the pilot.





### Delta fighter over the Pampas

The Argentine Government-owned Industrias Aeronáuticas y Mecanicas del Estado, Cordoba, are building a twin-jet supersonic fighter with delta wing, whose designation (*Pulqui III?*) has not yet been officially announced. First workshop photos and a general arrangement drawing show that the new design is a single-seater about 33 ft. in length and with a leading edge sweep of about 70 °. Its aerodynamic configuration would seem to support the claim that top speed is in the region of 800 m.p.h. The straight wing trailing edge carries elevons of constant chord. Air intakes for the jet engines (Rolls-Royce or Bristol) are in the straight wing roots, while the jet pipes protrude from the wing trailing edge on either side of the rudder unit.

### Angled deck gaining ground

The British Admiralty has announced further details of the 18,000-ton carrier H.M.S. Albion, which left Portsmouth on September 29th, 1954 for first operations in the Mediterranean. The *Albion* belongs to the Hermes Class and, like its sister ship the *Centaur,* has an angled flight deck (six arrester wires). It is the first carrier to be fitted with the Goodhart mirror landing sight (cf. *Interavia* No. 5, 1954) which takes over the functions of the landing signals officer. Two large aircraft lifts and an automatic bomb hoist operate between hangar deck, magazine and flight deck, and two steam catapults are let into the forward flight deck. Anti-aircraft armament consists of twenty-six 40-mm. Bofors guns arranged in groups in remote-controlled gun turrets. Each turret is controlled by its own fire control system with precision radar.

### YF-86K Sabre... with cannon

Early in September 1954 it was announced that a new version (YF-86K) of the U.S. Air Force's well-known North American *Sabre* had gone into production. In this new model the old .5-inch machine guns or 24 three-inch rockets are replaced by four 20-mm cannon. The YF-86K has already been ordered in quantity and will also be built by Fiat, Turin, under off-shore orders.—Power plant consists of a General Electric J-47-33 of 5,600 lbs. s.t. and an afterburner. Speed is given as "more than 650 m.p.h." and combat range as 500 miles. The new fighter has hydraulic power-boosted irreversible controls with artificial "feel" and is equipped with a North American automatic fire control system.

The change in armament has been made as a result of combat experience in Korea and extensive air combat exercises in the United States. It may be assumed that the U.S.A.F. will now re-equip all its first-line fighters with 20-mm cannon and guided rocket projectiles.—*Interavia* commented three years ago (cf. "Slingshots or Precision Weapons," in No. 10, 1951) on the inexplicable preference for .5-inch machine guns in the U.S.A.F. Other air forces and even the U.S. Navy have been using 20-mm or 30-mm cannon as standard weapons for a good many years.

# What's in the Air?*

## AVIATION POLITICS

### • Third Canadian-American radar chain

The United States and Canada have signed an agreement for provision of a third radar network over the northernmost part of North America, to ensure adequate warning of air attacks from the direction of the Arctic. The new Distant Early Warning system is also to extend over parts of the Atlantic and Pacific (presumably using aircraft and ship's radar), the U. S. Defense Department states. —The radar chain known as the "Mid-Canada Line", or the "McGill Line", plans for which were announced early in April 1954, is being financed by Canada alone, while the "Pine Tree Chain", which runs along latitude 54°, is a joint U.S.—Canadian enterprise.

### • U.S. Off-shore orders in Europe

General Orval R. Cook, Deputy Commander-in-Chief, U.S. Armed Forces in Europe, states that the total value of off-shore orders placed in Europe by the United States in the period 1952 to 1954 is $3,272,590,000, of which $2,500,000,000 were to equip the European N.A.T.O. countries and $700,000,000 for the upkeep of American military installations on European territory. During the 1953–54 budget year (up to June 30th, 1954) orders totalling $612,000,000 were placed ($395,000,000 for European, $217,000,000 for American forces). These orders were distributed among the various European countries as follows: United Kingdom $192,000,000; Italy $93,000,000; Belgium $37,000,000; France $22,000,000. Countries not belonging to N.A.T.O. received the following orders: Yugoslavia $14,000,000; Spain $10,000,000 West Germany $8,000,000; Switzerland (chiefly to American firms in Switzerland) $6,000,000.

### • Ministerial post for Henri Ziégler

Henri Ziégler, former Managing Director of Air France, and hitherto head of the Minister's Staff at the Ministry for Public Works, Transport and Reconstruction, has been appointed Inspector-General to the Ministry and given the rank of Air Engineer General.

## SERVICE AVIATION

### • Training of Spanish personnel in the United States

A first group of Spaniards (2 officers, 33 N.C.O.'s and civilians) has left Getafe for the United States under a programme for training Spanish Air Force technical personnel at U.S. Air Force bases. Courses are for technical instructors, engineers, photographers, ground electricians, airborne radio operators, etc., and will last from 14 to 43 weeks, depending on the branch concerned.

### • R.C.A.F. orders Sikorsky S-55s

The Royal Canadian Air Force has ordered ten Sikorsky S-55 helicopters for search and rescue work. The R.C.A.F. has already had two other American helicopter types, the Sikorsky S-51 and Piasecki H-21A *Work Horse*, in service for some time.

*S.A.S. changes its President:* On September 21st S.A.S. President *Per A. Norlin* (left) announced that he was resigning on December 31st, 1954.—New President will be *Henning Throne-Holst* (right), hitherto Swedish representative on the Executive Committee of S.A.S.'s Board.

*United Air Lines President William A. Patterson* (right) made a side trip to Zurich's Kloten airport while in Paris for the I.A.T.A. Meeting. He is seen here with *Swissair President Dr. W. Berchtold*, at the control desk of the engine test bed.

### • Land-based air defence for Australian approaches

The approaches to Australia are in future to be guarded by land-based Royal Australian Air Force long-range reconnaissance aircraft and bombers and not, as hitherto, by carrier forces, Air Minister Athol Townley announces. With their present range, land aircraft are quite capable of guarding the seaways up to 3,000 miles from the continent.—The new plans means retrenchment in the Fleet Air Arm. The light fleet carrier H.M.A.S. *Vengeance* will be used only for training and will be returned to the Royal Navy when the *Melbourne* with angled deck and steam catapult is delivered. The carrier *Sydney*, which it has been decided not to modernize, will also become a training vessel only.

## AIR TRANSPORTATION

### • K.L.M.'s 35th birthday

Bronze tablets showing the head of the late Dr. Albert Plesman, K.L.M.'s founder-President, were unveiled at the 86 K.L.M. offices through out the world on October 7th, 1954, to mark the company's 35th anniversary. General I. A. Aler, present K.L.M. President, announced on this occasion that since its foundation the company had carried 5,300,000 passengers and 220,000 tons of cargo. Altogether 402,000,000 km had been flown, which corresponds to 1,452,800 flying hours or 163 "flying years".

### • Air France's Orly maintenance centre

Air France's maintenance and overhaul centre at Orly has been granted licences by Britain's Air Registration Board for the overhaul of British aircraft.

Work it may perform includes the fitting of Vickers spares to *Viscount* turboprop airliners, even those with British registration markings. This arrangement will enable Air France and B.E.A. to reduce the stocks they hold through the exchange of spares.

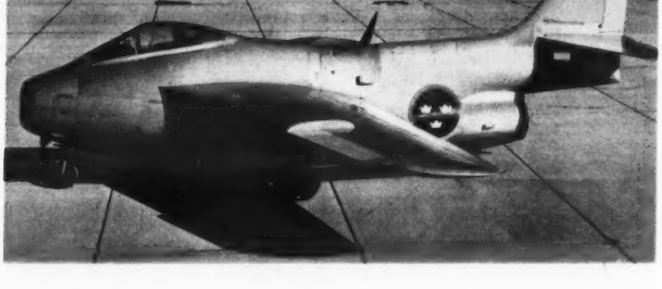
### • Clearing house procedure in American air transport

The Air Transport Association of America announces that its Clearing House in Washington

* Extract from *Interavia Air Letter*, daily international news digest in English, French and German. All rights reserved.

*Sikorsky S-59 (H-39)*, a helicopter with 400 h.p. Turboméca *Artouste II* gas turbine, which recently set up a new helicopter speed record of 251.06 km/hr. An interesting feature is the fully retractable undercarriage.

*Saab J 29F*, fitted with D.H.-Svenska Flygmotor *Ghost* (afterburner) and redesigned outer wings to improve flying qualities in the transonic speed range.



*Helicopter quadrille:* Four U.S. Army Bell H-13 helicopters dancing a quadrille at the Dayton, Ohio, National Air Show. At times the distance between the rotor blades was only a few feet.

handled interline offsets totalling $42,674,979 in August 1954, compared with $35,904,699 in August 1953, an increase of 18,86%.

**● Brazil to accept foreign commercial pilots?**

Air transport circles are interpreting a recent announcement by the Brazilian Air Ministry that sports pilots licences may in future be granted to foreigners (hitherto they have been issued to Brazilian nationals only) as a hint that some relaxation may soon be made in the licensing restrictions on foreign commercial pilots. The present rigid exclusion of foreigners accords ill with the marked shortage of Brazilian commercial pilots.

## INDUSTRY

**● German engineers trained at Farnborough**

The School of Gas Turbine Technology at Farnborough, England, has recently completed its Thirteenth International Course, which was attended by representatives from Finland, France, Holland, Italy, the United States and—for the first time—Germany. The School is run by Power Jets (Research & Development) Ltd. and is the only one in the world devoted exclusively to gas turbine technology.

**● Westland interested in Sikorsky S-56**

Eric Mensforth, Chairman of Westland Aircraft Ltd,—who have specialized in the licence production of Sikorsky helicopters—states that his company is interested "in the basic engineering of the American S-56 helicopter" (projected civil version of the twin-engined Sikorsky HR25 assault helicopter, for 35 passengers and crew of two).—Lord Douglas of Kirtleside, Chairman of B.E.A. (who recently bought two Westland-Sikorsky S-55s for its feeder services between Waterloo and London Airport), has expressed the opinion that the S-56 "appears to be the first of a new generation of helicopters."

**● Order backlog in U.S. aircraft industry**

Manufacturers of airframes, engines and propellers held orders totalling $15,247,000,000 on June 30th, 1954, the U.S. Civil Aeronautics Administration announces. This compares with a backlog of $16,100,000,000 on March 31st, 1954 (—5%) and $18,925,000,000 on June 30th, 1953 (—19%).

René Lemaire, France's Secretary General for Civil and Commercial Aviation, has been made Commander of the Legion of Honour.

Air Commodore F. R. Banks, the well-known British engine expert, has been made a director of The Bristol Aeroplane Company.

## FLYING EQUIPMENT

● First flights have been made by a vertical take-off experimental aircraft built by *Bell Aircraft Corp.* Development of the prototype, which is apparently the forerunner of an interceptor fighter, was begun 18 months ago. Bell designation for the type: VTOL (Vertical Take-off and Landing).

● *Cessna OE-2* is the type designation of an improved Navy version of the Cessna L-19 Army communications aircraft. Flight testing has begun.

● The Royal Swedish Air Force has decided to modernize an undisclosed number of Saab J29 jet fighters. Type designation of the modified version: Saab J29F.—Main features are fitting of an afterburner (developed jointly by the Royal Swedish Air Board and Svenska Flygmotor A.B.) and modified outer wings (increase in critical Mach number and improved flying qualities in the transonic speed range). The first J29Fs are scheduled for delivery to the squadrons before the end of the year.

● Testing of the Dassault *Mystère IV* and *Mystère IV N* jet fighters (Rolls-Royce *Avon RA.7* turbojets with reheat) has now been completed. The *IV N* night fighter version is considered to be the first two-seater capable of Mach 1—plus in level flight.—The *Mystère XX* (R.-R. *Avon RA.14*), a development of the *Mystère IV*, is expected to make its first flight next spring. Its calculated max. speed is in the region of Mach 1.3.—The *Dassault MD.550* lightweight supersonic fighter will also begin flight testing in the spring.

● Bréguet is surveying possible markets for its *Bréguet 901* high-performance glider, in which Gérard Pierre won the World Gliding Championships this summer. To reduce production costs, it is planned to make extensive use of plastic skin, which will considerably reduce manufacturing time.

● *Nord 2520* is the designation of a new commercial transport projected by SNCA du Nord and derived from the Nord 2501. In addition to two Bristol *Hercules* piston engines, it will be fitted with two Turboméca auxiliary jet engines at the Wing tips. Some 60% of the 2520's parts will be interchangeable with those of the 2501. No prototype can be begun, however, until funds are granted (in France's next budget).

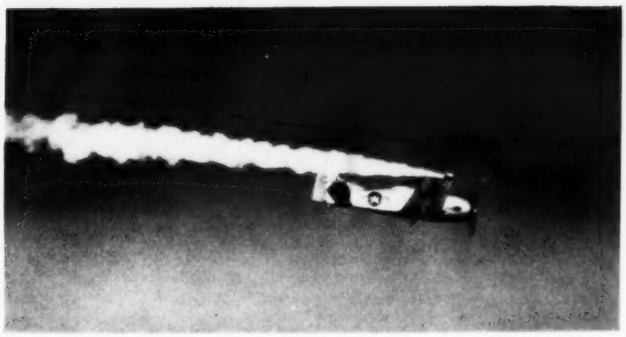
## POWER PLANT

● *Bristol Proteus 755*, the latest version of the well-known propeller turbine designed by The Bristol Aeroplane Co.'s Engine Division, is to be fitted in the *Bristol Britannia Mark 250 and Mark 300*. With its power of 4,150 e.h.p., the engine has a 10% higher performance than its predecessor, the *Proteus 705*. Structure is similar in essentials, except that the accessory drive shaft has been replaced by a direct-mounted generator which supplies power to the accessories.—Any *Proteus 705* can easily be converted (e. g. during overhaul) into the *755* version.

● The U.S. Marine Corps recently demonstrated rockets as a take-off aid for Sikorsky HRS-2 (S.55) helicopter (three-blade rotor) at Anacostia Naval Air Station, near Washington. Rockets weighing 1 lbs. each and mounted at the blade tips (ROR = Rockets on Rotor) are said to increase take-off power by about 20% and permit of increased take-off weight.

● Rumours that a Convair-Liner is to be fitted experimentally with two 3,000 e.h.p. Napier *Eland* propeller turbines have now been confirmed. Details are not available, but it would seem that conversion work will be done in Britain.—The *Eland* which has been under test for the past year, impressed air transport circles with its good take-off performance and strikingly quiet operation when it was demonstrated in a twin-engined Vickers *Varsity* flying test bed.

*Assistant U.S. Air Force Secretary Roger Lewis* (centre, looking right), on a European tour which took him to Britain, France and Italy, visiting the Aerfer plant at Pomigliano d'Arco, near Naples.
*Assistant U.S. Air Force Secretary Roger Lewis* in England: talking to Wing Commander Dickie Martin (left), Gloster's Chief Test Pilot.

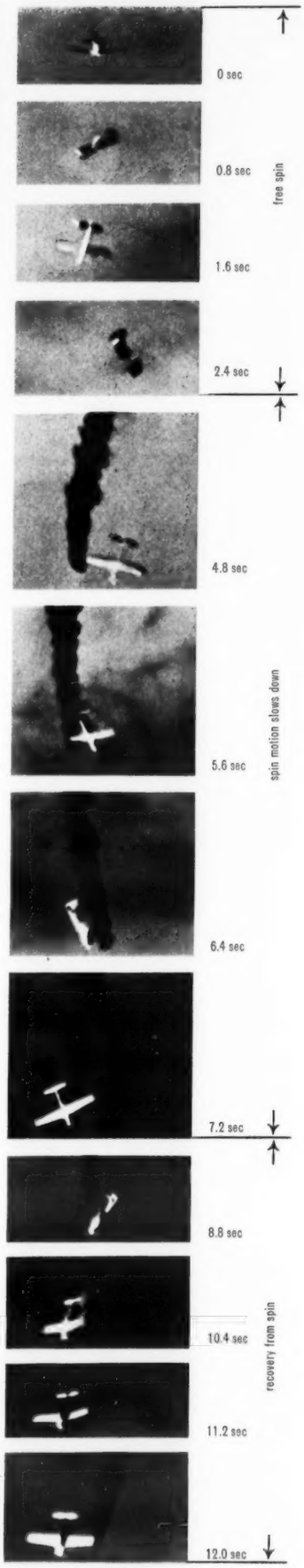


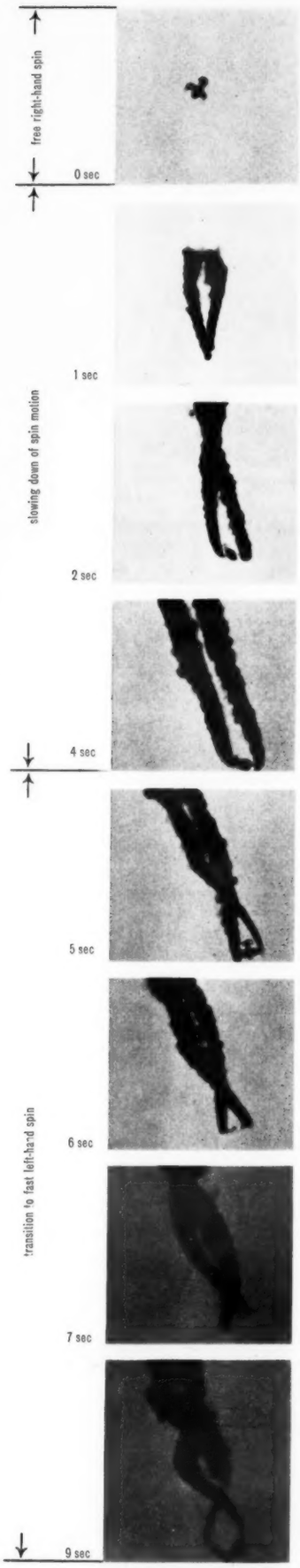
**1** North American T-28 two-seat trainer on a test flight to determine rocket yawing moment.

## ANTI-SPIN ROCKETS

Constantly increasing speeds of flight mean a growing difference between maximum and minimum speed and necessitate close investigation of slow flight behaviour. Spin characteristics must also be determined, since they are of the utmost importance to the test pilot. Experience has shown that modern jet fighters develop speeds of up to 200 knots in a spin, whereas the strongest nylon cables in anti-spin parachutes hitherto used break at 160 knots.

To remedy this situation, North American Aviation Inc. has been experimenting with a new anti-spin method which flight tests have so far shown to be promising: take-off rockets mounted at the wing tips are fired by the pilot as needed against the direction of spin to pull the aircraft safely out of the spin.—In a total of 16 spin tests in a North American T-28 Chief Pilot Welsh and Test Pilot Darnell experimented with different positions for the rockets: at the rear of the fuselage, under the outer wings and at the wing tips (fig. 3). In all 16 tests the aircraft could be pulled out of the spin within a few seconds with the aid of the rockets. The left film strip shows clearly how the spin motion is slowed down by the firing of a wing-tip rocket, until the rotary movement is completely overcome. In one case two rockets—one at each wing tip—were fired simultaneously (right-hand film strip); the aircraft recovered after only half a turn, but immediately went into a pin-wheel flat spin in the opposite direction, from which the pilot extricated himself only after twelve turns and a loss of more than 10,000 ft. in. altitude. As past tests have been so successful, the new anti-spin method is shortly to be tried out in the TF-86 *Sabre* two-seat jet trainer and F-100 *Super Sabre* supersonic fighter. Aerojet Junior JATO rockets burning for seven seconds will probably be used.




**2** Chief Pilot Welsh (left) and his colleague Darnell.

**3** JATO rocket mounted in the port wing tip of a T-28A.

# Italy's Contribution to High Frequency Engineering

BY PROFESSOR ALGERI MARINO, ROME

*The author, professor of electromagnetic communications engineering at the Engineering Faculty of the University of Rome, is also chairman of the Italian Post Office's Technical Advisory Committee on Communications and Lieutenant-General in the Italian Air Force Engineers Corps. As founder and scientific head of the radio-electric research centre at Guidonia, director of the Radio Centre, Rome, member of the National Research Council, of C.C.I.R.* (Comité Consultatif International de Radio) *and of U.R.S.I.* (Union Radio Scientifique Internationale), *and finally of the United States Institute of Radio Engineering, Professor Algeri Marino is well known in the international radio field.* *Editors.*

The development of modern high frequency engineering shows certain unusual features which are worthy of closer examination. A first peculiarity is that it owes its growth and its richest applications to experience in the aeronautical field, where it has solved important problems in aircraft equipment, produced radio-electric navigation aids, and systems of radio communication between air and ground. Today, however, it has extended its sphere to many other branches of activity, so that it can no longer be considered purely from the aeronautical point of view, but must be examined in its more general applications.

Another no less interesting feature is that all progress in electronics has been achieved by the *use of higher and higher frequencies*. In the latest equipment, radio-electric frequencies have already approached the neighbourhood of heat radiation.

A third peculiarity is that the rapid advances of the past few years in the electronics field have been due to the vast mass of experimental and research work that has been accomplished, whether in the purely scientific field, or in the applied field of industrial production and application of equipment.

Pure *scientific research* has produced specialized electronic components for the highest frequencies, for example klystrons, magnetrons, etc. It has also led to the creation of numberless special materials, including certain dielectric materials for very low losses, magnetic materials of high permeability and a vast collection of semiconductors which have given rise to modern transistors. The latter will replace, in the near future, many of the normal electronic tubes and open up entirely new prospects for high frequency engineering.

*Applied research* in industry and test centres is aimed at ensuring facility of operation of modern electronic equipment and reliability in time and space, even under very severe or varying conditions and high mechanical stress. Its purpose is also to systematize equipment and reduce manufacturing costs to the minimum.

Scientific and industrial research have thus by no means been restricted to experiments, but have generated new theoretical knowledge on the highest level and opened up new branches of science. A good example of the latter is provided by servo mechanisms, originally created to solve aeronautical problems, but since applied to many other fields. The same applies to modern " feedback " theory leading to cybernetics, and to electronic computers of either the analogue or the numerical variety. The field of application of all these theories and their corresponding equipment is constantly widening.

A fourth peculiarity of modern electronics is that it requires the use of precision materials and components. This, along with the need for reducing weight and bulk, has necessitated the introduction of new industrial production methods and new technology, among the most important of which are *miniaturization* and *sub-miniaturization*.

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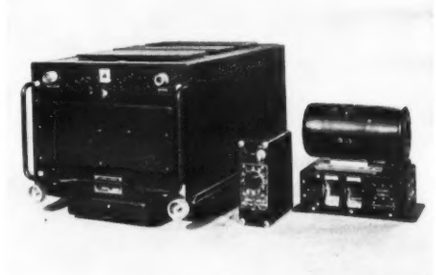
Fabbrica Italiana Magneti Marelli (Milan) : airborne VHF R/T equipment, type 1 ARC (SARAM licence).



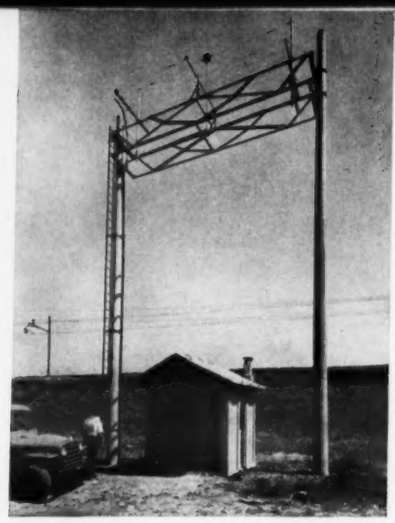
If in the light of the above brief summary we examine the present and future prospects of the various nations as regards scientific and industrial research, it immediately becomes apparent that advanced basic scientific research can only be undertaken by wealthy nations. Applied research, however, though it today requires highly-equipped laboratories and experienced scientists, can more easily be restricted to given applications and can therefore still be pursued with good results by nations of more limited resources, provided they have adequate technical and scientific experience and equipment.

In this connection attention may justifiably be called to the progress made in recent years in Italy both in the industrial field and in the national utilization of latest electronic developments. This progress is due to the initiative of a small band of scientific, technical and industrial experts which grew up in Italy between the wars.

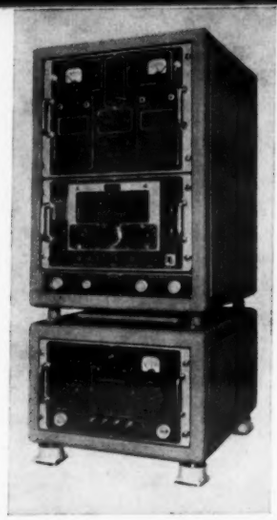
To be able to assess correctly Italy's effort in the electronic field, is should be remembered that it follows immediately after a most difficult period. In the early post-war years some of the best Government electronic laboratories lay destroyed, and the electronics industry was crippled by lack of orders and by the departure of many of its experts to other countries or to more rewarding activities.

The progress made despite these difficulties is almost miraculous, thanks to the courageous initiative, during this period between 1945 and 1950, of certain industrial organizations which managed to maintain their efficiency and improve their plant through purely civil production. Overcoming all obstacles, they have introduced and perfected new high frequency techniques for civil use, such as the technique of coaxial cables, telephone links, frequency modulated radio and television.

Fabbrica Italiana Magneti Marelli (Milan) : transmitter unit for a television link

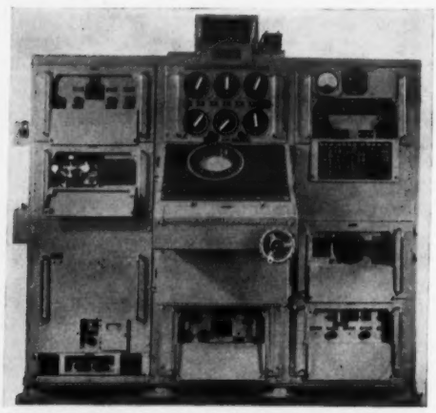


Fabbrica Apparecchiature per Comunicazioni Elettriche (Milan) : middle marker for the ILS-3 system at Rome-Ciampino Airport.



Marconi Italiana (Genoa) : Transmitter-receiver for 60 W input power for A1-A2-A3 waves, in the 200-550 kc/s and 1,500-13,000 kc/s bands, with quartz stabilization.

Microlambda (Naples) : Screen of ship's radar navigation equipment type M.1500 (Raytheon licence).



Fabbrica Italiana Apparecchi Radio (Milan) : Screen of the type 3 Mk. 7 mobile radar gun laying equipment. In addition to presentation of the target echo in the cathode ray tube, six instrument readings are provided.

Fabbrica Italiana Apparecchi Radio (Milan) : mobile radar laying equipment for anti-aircraft batteries, type 3 Mk. 7, with window screens open and aerial assembly at operational readiness.

Then, after the creation of N.A.T.O., these civilian developments were followed by equally modern advances in the military field, such as radar, radio navigation aids for aircraft and shipping, mobile communications equipment, and so on.

*

The following account of some of the most outstanding achievements of the Italian electronics industry will give some idea of the present position in this field.

The first striking achievement is in the use of *coaxial cables* for telecommunications. Here Italy has played a leading part with the production of miniaturized telephone multiplex cables and of wide-band boosters for 960 simultaneous telephone conversations or for high-quality television relays on the European standard.

Excellent results have also been obtained in the domain of radio links, of both pulse and frequency modulated types, for moderate traffic (telephone channels variable between 12 and 120, VHF and UHF bands up to 2,000 mc/s) and in that of a new type of radio link for heavy traffic, working in the 4,000 mc/s band, with 3,000 telephone channels in five groups and a broad-band television channel which can also be used for colour television.

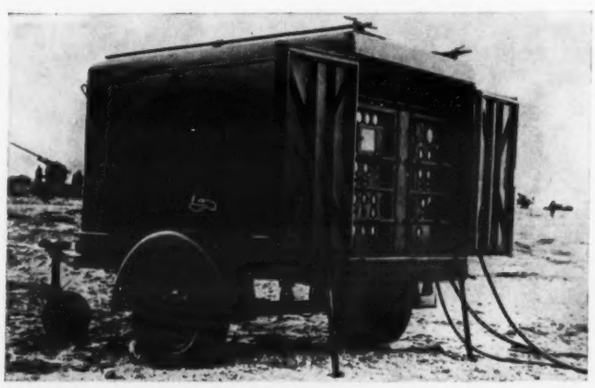
In the field of *radio aids to air navigation*, mention should be made of the improved ILS-3 equipment for landing in bad visibility, of ground and airborne VHF equipment for a number of pre-selected frequencies and of numerous D/F developments.

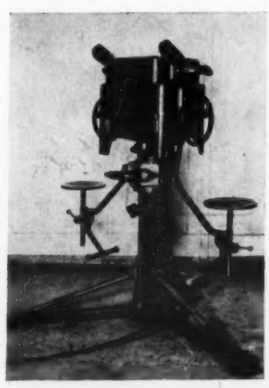
As regards *radar*, the Italian industry has brought out a wide range of equipment. Examples are medium and long range early warning units working on 1,200 mc/s, fire control radar for guns, working in the 3,000 mc/s band, and a wide range of aircraft and ship's radar with carrier frequencies of around 10,000 mc/s.

Then there are *mobile radio equipment* of the SCR 300, AN/TRC 3-4 and other miniature and sub-miniature types, and MF and HF *radio transmitters* of 300 W and 1,000 W with preselected frequencies, as well as modern receivers for the most varied uses. In close collaboration with the Swiss industry, the Italians have also achieved especially good results in the production of electronic switchboards.

*Television* equipment includes transmitters for up to 5 kW power, television repeater stations and a wide variety of television receivers for civil use. — Considerable

Contraves Italiana (Rome) :
F.90 electronic computer (left) and T.90 optical laying equipment for 90-mm anti-aircraft guns.





## Products of the Italian High Frequency Industry

| | |
|---|---|
| **CO-AXIAL TELEPHONE CABLES** | |
| Multiplex telephone equipment for up to 960 lines and broad-band telephone boosters for 960 lines | Fabbrica Apparecchiature per Comunicazioni Elettriche (FACE) — Milan ; Siemens — Milan<br>Fabbrica Apparecchi Telefonici e Materiale Elettrico (FATME) — Rome |
| Boosters for television relays by co-axial cable | FACE — Milan ; Siemens — Milan |
| **TELEPHONE AND TELEVISION LINKS** | |
| Equipment for medium traffic density (pulse method), for 8-12-24 channels | Fabbrica Italiana Magneti Marelli — Milan<br>Marconi Italiana — Genoa |
| Equipment for medium traffic density (frequency modulated) for 24-60 channels | Magneti Marelli — Milan ; FACE — Milan<br>Marconi Italiana — Genoa ; Società Telettra — Milan |
| Equipment for television wave relays (European standard) | Magneti Marelli — Milan |
| Equipment for high traffic density (Rome-Pescara), for 3,000 telephone lines and one television line | Magneti Marelli — Milan |
| **RADIO-COMMUNICATIONS AND RADIO NAVIGATION AIDS FOR AVIATION** | |
| ILS-3 landing system | FACE — Milan |
| VHF airborne R/T equipment for 12 selectable frequencies | Magneti Marelli — Milan |
| VHF ground R/T equipment | Magneti Marelli — Milan |
| D/F equipment | Officine Galileo — Florence |
| **RADAR EQUIPMENT** | |
| AN/TPS-1E radar warning equipment (land), SG-6B (sea) and MLA-1 (sea) | Microlambda — Naples |
| Radar controls for anti-aircraft batteries, type 3 Mk. 7 | Fabbrica Italiana Apparecchi Radio (FIAR) — Milan |
| Radar navigation equipment for ships | Microlambda (type M.1500) — Naples<br>Segnali Marittimi & Aerei (type SMA) — Florence |
| **ELECTRONIC COMPUTERS FOR FIRE CONTROL** | |
| F.90 computer and T.90 optical laying equipment, for 90-mm guns | Contraves Italiana — Rome |
| **ACCESSORIES FOR RADIO EQUIPMENT** | |
| SCR 300 equipment | FIAR — Milan ; Marconi Italiana — Genoa |
| AN/TCR3/4 equipment | Magneti Marelli — Milan |
| Radio equipment with single sideband | FACE — Milan |
| 300 W transmitters for predetermined frequencies | FACE — Milan ; Magneti Marelli — Milan |
| 1,000 W transmitters for predetermined frequencies | Marconi Italiana — Genoa ; Allocchio & Bacchini — Milan |
| Multi-purpose receivers | Allocchio & Bacchini — Milan |
| **ACCESSORIES FOR TELEVISION EQUIPMENT** | |
| Television transmitters of various powers | Marconi Italiana — Genoa ; Magneti Marelli — Milan |
| Television repeater stations | Siemens — Milan |
| Television receivers | approx. 20 manufacturers |
| Frequency-modulated VHF radio transmitters | Marconi Italiana — Genoa ; Magneti Marelli — Milan |
| **ELECTRONIC TUBES AND PICTURE TUBES** | |
| Normal and miniature electronic tubes for transmitters and receivers of all kinds | Fabbrica Italiana Valvole Radio Elettriche (FIVRE) — Pavia<br>Philips — Monza ; Marconi Italiana — Genoa |
| Special tubes for radar equipment | Philips — Monza<br>Fabbrica Italiana Radrizzatori Apparecchi Radioelettrici (FIRAR) — Genoa |
| Picture tubes | Philips — Monza ; FIVRE — Pavia |
| **SPECIAL ELECTRONIC EQUIPMENT** | |
| SONAR MLS-1 equipment for mine detection | Microlambda — Naples |
| BENDIX radio-sondes | Industria Radiotecnica Italiana Autovox — Rome |
| Electro-cardiographs | Officine Galileo — Florence |
| **COMPONENTS FOR HIGH FREQUENCY EQUIPMENT** | |
| Normal and miniature condensers with various types of insulation (air, ceramics, etc.) | Industria Condensatori Apparecchi Radioelettrici (ICAR) — Milan<br>Società Microfarad — Milan ; Società Scientifica Radio Brevetti Ducati — Bologna ; Società Geloso — Milan |
| Resistances and potentiometers | Società Elettrotecnica Chimica Italiana (SECI) — Milan<br>LESA — Milan ; Radio Magnadyne — Turin ; Società Ophidia — Trieste |
| Piezo-electric quartz, oscillating circuits, luminous materials | Magneti Marelli — Leghorn ; Ducati — Milan ; Società Azionaria Radio — Rome ; Officine Galileo — Florence |

progress has also been made in the production of miniature and sub-miniature electronic tubes and of special tubes for very high frequencies, such as magnetrons for radar and picture tubes for television.

These products of the Italian electronics industry have been listed in the accompanying *table*. Though this list is far from complete, it does illustrate clearly the high level reached by the Italian industry, which is today in a position to produce any kind of electronic equipment, no matter how complicated, by the most modern methods.

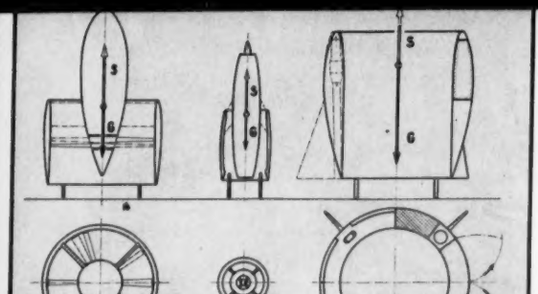
In addition to the normal production indicated, the industry is also working on *experimental* equipment, including in particular radio-electric shell fuses and multi-channel VHF equipment for aeronautical use.

*

Passing from the question of production to that of application, it may be stated that Italian aircraft and airports, both civil and military, are today equipped with the most up-to-date electronic apparatus, such as ILS-3, GCA, VOR, DME etc. In addition a network of coaxial cables and radio links and a modern television service now cover a great part of the country.

The above results have been achieved through a complete overhaul of Italy's industrial plant and the introduction of new technological processes in the production of both components and complete equipment. The larger companies have had to set up well-equipped laboratories for scientific and technical research, staffed by experienced scientists. It has also been necessary to expand the Government laboratories and create special schools of electronics. All this has largely been made possible through the efforts of leading officials of the Italian Telecommunications Ministry, Defence Ministry and Industry Ministry. Special recognition should go to Engineer Albino Antinori and General S. A. Silvio Napoli, who have recognized the importance of modern electronic problems in the national economy and have overcome innumerable difficulties of all kinds through devoted, untiring work.

If Italy's electronic industry is to consolidate its position in the international field still further effort will be needed in the years to come. New developments will be introduced, such as *transistors*, which are destined to play a most important part in many branches of application, particularly in aviation.



*Bureau Technique Zborowski* : Three basic forms of vertical take-off " coleopters " (elevation and plan) ; left to right : subsonic coleopter with propeller turbine ; supersonic coleopter with turbojet and ramjet ; flying wing coleopter with four large turbojets.

**AUTUMN HIGHLIGHTS :**

# THE WGL MEETING IN DUISBURG

**(October 14th to 16th, 1954)**

Another indication of the fact that Germany is regaining her position among the nations was provided by the marked interest shown by foreign and German experts from abroad in the 1954 Meeting of the Wissenschaftliche Gesellschaft für Luftfahrt (German Society for the Aeronautical Sciences) which was held in Duisburg in mid-October. In addition to a large number of German professors, heads of institutes, representatives of the Lufthansa, the Blank Office, the Federal and Land Transport Ministries, and of former aeronautical engineers now working in other branches of engineering, there were the following visitors from overseas :

*Lecturers* (in the order in which they read their papers) : Dr. H. J. Allen (N.A.C.A., Moffet Field, U.S.A.) ; A. E. Raymond (Douglas Aircraft Co.) ; Dr. Ing. H. Oestrich, Dr. Ing. H. Münzberg and Dr. Ing. G. Richter (all from SNECMA, France) ; Dipl. Ing. H. von Zborowski, Dr. W. Seibold and Prof. H. Hertel (all from Bureau Technique Zborowski = BTZ) ; Engineers G. Eggers and G. Ernst (SNECMA) ; Dr. E. R. van Driest (North American Aviation Inc.) ; Dr. W. Jacobs (National Experimental Institute, Stockholm) ; C. H. E. Warren (R.A.E., Farnborough) ; Dr. Ing. K. G. Guderley (Wright Air Development Center, U.S.A.) ; Dr. von Baranoff (Onera, Paris) ; Dr. H. Behrbohm (Saab, Linköping) ; Prof. Dr. med. K. Wiesinger (Zurich); Dr. med. K. Schindl (Vienna) ; Prof. Dr. med. T. Lomonaco (Rome) ; Dr. med. J. Ruiz-Gijon (Madrid) ; Dr. med. A. Valle (Madrid) ; Prof. Dr. L. Broglio (Rome); Prof. G. Gabrielli (Fiat, Turin) ; Dr. Ing. K. H. Doetsch (R.A.E., Farnborough).

*Prominent guests* (in alphabetical order) : Major General H. G. Armstrong (Surgeon General, U.S.A.F., Wiesbaden); Dr. A. Baeumker (Air Research and Development Command, U.S.A.F., Baltimore) ; Prof. C. Dornier (Zug, Switzerland) ; Dr. Gullstrand (Saab, Linköping) ; President Jarry (Afita, Paris) ; Prof. Th. von Karman (Agard, Paris) ; Dr. Ing. G. V. Lachmann (Handley Page Ltd.) ; Colonel A. Nuñez (Madrid) ; Dr. Kl. Oswatitsch and Prof. Th. Rand (KTH, Stockholm) ; Dr. F. Reissner (M.I.T., Baltimore, U.S.A.) ; Prof. M. Roy (Onera, Paris) ; Prof. K. Tank (IAME, Cordoba) ; Prof. H. Winter (T.H. Graz) ; Major G. Zinnemann (Agard, Paris).

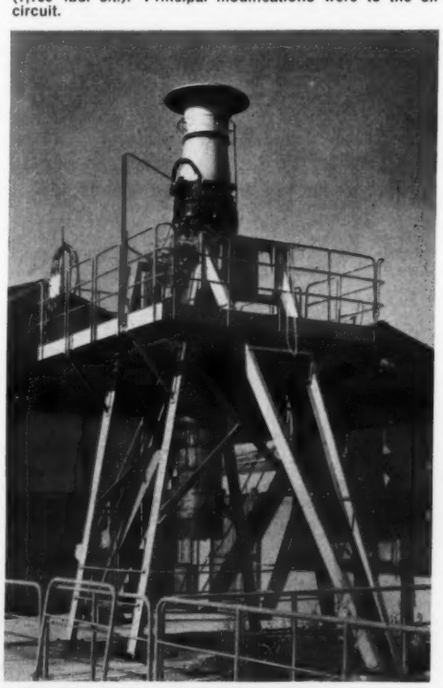
■

Addresses of welcome by *Prof. Dr. H. Blenk*, Chairman of WGL, *K. Arnold*, Prime Minister of North Rhine-Westphalia, and *A. Seeling*, Mayor of Duisburg, were followed by a special paper by *Secretary of State Prof. L. Brandt* on *" The Importance of Aviation in the Reconstruction of Germany "*. He described the aircraft industry as an economic necessity, since it fertilizes all other branches of industry and makes the heaviest demands on lightness of weight and reliability.

The series of technical papers read on the first day was introduced by *Dr. H. J. Allen*, of N.A.C.A., who spoke on *" Transonic Wind Tunnel Developments of the N.A.C.A."*. He described two types of tunnel which showed satisfactory results thanks to the elimination of shock wave reflection (choking) at sonic speeds : the slotted-wall-type test section and the perforated-wall-type test section. Wind tunnel measurements and free-flight tests showed a considerable degree of similarity. —He was followed by *A. E. Raymond*, Vice-President, Engineering, of Douglas Aircraft Co., who stressed in particular the necessity for complete and detailed operational testing of commercial transports. Speed is not the only criterion, and in designing civil airliners it is preferable to progress slowly rather than seek all-out advances at the cost of safety and economy. He confirmed that Douglas is planning a propeller-turbine version of the DC-7, but that it would not be built until proven civil turboprop engines are available (Rolls-Royce RB.109?). The same applies to the Douglas DC-8 jet transport.

*Dr. Ing. H. Oestrich*, Technical Director of SNECMA, Paris, outlined the development of the SNECMA ATAR 101 turbojet since 1946 and disclosed first data on the 101E series : diameter 36.25 ins., weight without jet pipe 1,810 lbs., static thrust 7,720 lbs., lowest thrust/weight ratio ever attained (for a production engine), namely 0.235 ; max. fuel consumption 1.05 lbs./lb.h, cruising consumption under 1 lb./lb.h. Dr. Oestrich concluded : " We have succeeded, as a cooperative of French and German engineers, not only in creating a power plant of international reputation, but also in proving that German and French nationals are capable, even under difficult conditions, of forming a permanent working community with mutual respect for both parties—without which such collaboration would not be possible. In my opinion this fact is of considerable interest at the present moment when there is so much talk of European cooperation."

*SNECMA* : Test rig for vertical take-off version of the ATAR 101D turbojet (6,600 lbs. static thrust) and ATAR 101E (7,700 lbs. s.t.). Principal modifications were to the oil circuit.



Some two dozen other technical and 14 medical papers were read during the Meeting. The real sensation, however, was provided by the eagerly awaited *papers on a new concept of vertical take-off jet aircraft with annular wing*. Count Zborowski and two of his closest colleagues at the BTZ (founded in 1952 at St-Antoine, Brunoy, Seine-et-Oise, France) spoke on " coleopters ", and two representatives from SNECMA, Engineers Eggers and Ernst, on vertical take-off jet aircraft. Zborowski described a coleopter (in zoology coleoptera are an order of beetles whose fore-wings form sheaths for their hind-wings when folded) as any flying machine with annular wing, whose longitudinal axis of symmetry coincides with the thrust vector of the power plant. The latter (see drawing) may consist of propeller turbine or turbojet. The annular wing was chosen because it has the lowest structural weight, provides less drag than cruciform wings, can be used as jacket for *supersonic ramjets* and finally—when propeller turbines are used—permits of about 20% better take-off thrust than a free-jet propeller. Zborowski's patents, which promise both military and civil aircraft a speed range from hovering to almost double the speed of sound, go back to 1950. SNECMA, which has taken an option on the patents, is also working along the same lines.

The introductory paper to the series, entitled *" Considerations on the Design of Coleopters "*, was read by Count Zborowski himself, who said that the increasing urge towards economy throughout aviation has led to a new concept of aircraft with annular wings. These " coleopters " combine the advantages of the helicopter with those of high-speed aircraft—even in the supersonic range—without the complications of the convertible aircraft, and would have high economy for both civil and military uses. Zborowski was followed by *Dr. W. Seibold* (BTZ), who spoke on *" The Annular Wing both as Lifting Surface and Propulsor "*. The use of annular wings as both power plant and lifting surface would bring with it advantages hitherto

unknown in aircraft of conventional design. Notable examples are full aerodynamic symmetry and consequent ease of control in space, and the elimination of troublesome interactions between individual movements (no combined yawing and rolling moments). Dr. Seibold also discussed lift and drag in the subsonic range and thrust characteristics, and touched briefly on the question of thrust losses with non-adapted engine intakes or outlets.

*Prof. H. Hertel* (BTZ) spoke on "*Structure of the Annular Wing*". The annular wing absorbs both aerodynamic and mass forces and transmits them to the lift system without substantial flexures. The lift system of the wing is a tube of large diameter with two main stiffening rings. Best design is a load-bearing panel and an outer cowling. — With suitable design, weight per square foot is very low. This weight advantage so far compensates the disadvantages of the annular wing's higher drag compared with the plane wing of the same lift, that even for long ranges all other advantages of the annular wing—including its ability to serve as part of a ramjet or a tunnelled propeller—can be regarded as "extras".

The remaining "*Contributions to Vertical Take-off*" began with the statement by *Engineer G. Eggers* (SNECMA) that the development of high-speed jet-powered aircraft for vertical take-off and landing has been made possible by advances in jet turbine design, in conjunction with a lighter airframe. Eggers then described methods of achieving jet control and controllability in jet-sustained vertical flight. The engine for such an aircraft must have a specific weight of about 0.2 lbs./lb.t. The SNECMA ATAR comes very close to this figure in its new "E" version (0.235), and in future it will even be possible to get below the value of 0.2. — The rotating parts of the turbojet strongly affect the movements of the machine, especially at lower speeds in vertical flight. Rolling motion must be stabilized, and elevator and rudder controls combined so as to compensate the gyroscopic effects. Stabilization of motion about the centre of gravity by means of gyroscopes gives the pilot the normal feel of aerodynamic flight. It would also be necessary to stabilize the transverse motions, arising when the machine is inclined, by integrating the accelerations. This system is particularly important in vertical descent, to prevent a given maximum speed of descent from being exceeded and to enable touchdown to be made at a speed of almost zero. — The change-over from vertical take-off to horizontal flight is a gradual transition from jet-sustained to aerodynamic flight, with the machine remaining in the range of small angles of attack. Two limit cases were considered for landing: (1) the aircraft zooms up and then drops back on its tail, losing speed; (2) the aircraft gradually turns nose upwards without gaining altitude. The best method is somewhere between the two. A picture of a high-speed aircraft for vertical take-off and landing with annular wing and ATAR 101E lightweight turbojet, in which the pilot operates in a prone position, was shown. — Eggers also mentioned that SNECMA had tested vertical flight versions of its ATAR 101D and 101E on a special test rig and is working on spoiler controls (four annular elements at the end of the jet pipe) on the "yes-no" system.

Finally *Engineer G. Ernst* (SNECMA) and *Prof. A. W. Quick* (DVL) spoke on the "*Effect of Gyroscopic Forces of a Turbojet during Vertical Take-off and Landing*". The rotor of a turbojet produces gyroscopic forces which are particularly noticeable at the low speeds of vertical take-off and landing. At take-off the aircraft is aerodynamically stable. The gyroscopic forces cause the resulting rotary motion to deviate from the motion imparted by the controls. The deviation of this vector, which is about 90° at zero speed, decreases with increasing speed and has practically disappeared at about 100 m/sec. During vertical landing, however, the aircraft descends tail first, so that it is aerodynamically unstable. The combination of gyroscopic forces with these unstable aerodynamic forces produces a tendency for the aircraft to tip over at low speeds, which must be allowed for in installing the controls. The gyroscopic forces can be overcome if a steering moment is created, at right angles to the axis of the desired movement and proportional to the angular velocity of the latter. The accuracy of this method of compensating gyroscopic forces has been tested on a model.

*

The Plenary Members Meeting elected the following four eminent scientists as *honorary members* of WGL: Prof. Dr. Theodore von Karman (Paris), Prof. Dr. Albert Betz (Göttingen), Dr. A. Baeumker (Baltimore, U.S.A.) and Prof. Dr. Ing. Reissner (New York).

# Shock Waves and Thermal Discontinuities in Supersonic Flows

*(Conclusion cf. No. 10, 1954)*

BY JEAN J. GINOUX, BRUSSELS

## 5. Expansion waves

Shock waves always produce a compression of the fluid passing through them and an increase in the entropy of the gas. There is no stationary discontinuity to produce an expansion. The latter takes place continuously.

Consider, for example, the wall in *fig. 13*, whose slope varies suddenly at point A. Calculation shows that a supersonic flow $(M_1, p_1, T_1)$ parallel to $A'A$ is progressively diverted in zone $BAC$ centred at point $A$, to become parallel to $AA''$ when

$$M_2 > M_1 \text{ und } p_2 < p_1 \text{ (expansion).}$$

The two straight lines $AB$ and $AC$ are Mach lines originating from $A$ at angles $\mu_1$ and $\mu_2$, with speeds $V_1$ and $V_2$, where

$$\sin \mu_1 = \frac{1}{M_1} \text{ and } \sin \mu_2 = \frac{1}{M_2}$$

The zone limited by $AB$ and $AC$ is an expansion wave centred at $A$, formed by the infinity of Mach lines representing the continuous transition from Mach $M_1$ to Mach $M_2$. A wave of this kind can be seen in the photograph in *fig. 7*.

## 6. Reflection of oblique plane shock wave from a plane wall

Let us now examine what happens when an oblique plane shock wave meets a plane wall, such as is the case of the shock wave from a model of infinite span in the test section of a supersonic wind tunnel.

Assuming that the shock wave originates from a corner of angle $\theta$ in a supersonic flow $M_1$ parallel to wall $\omega$ *(see fig. 14)*.

The oblique shock wave diverts the flow over its whole length towards the top of

Fig. 13: Creation of an expansion wave by sudden variation in the slope of the wall at point A. A supersonic flow parallel to A'A is progressively diverted about point A, to become parallel to AA".

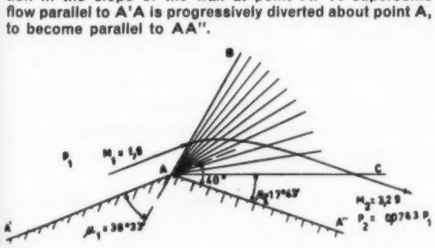


Fig. 14: Reflection of an oblique shock wave from a plane wall, when $\theta$ is less than limit deviation angle $\theta_m$ corresponding to $M_2$.

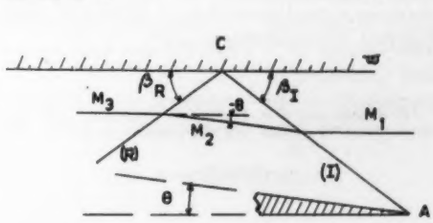
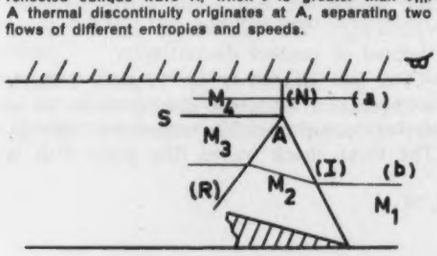



Fig. 15: Formation of a Mach configuration (with three shock waves) with perpendicular shock wave N and reflected oblique wave R, when $\theta$ is greater than $\theta_m$. A thermal discontinuity originates at A, separating two flows of different entropies and speeds.



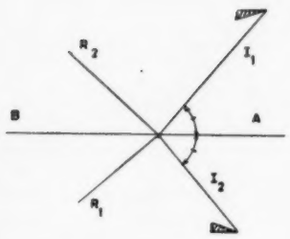



Fig. 17 : Interaction of two oblique shock waves of the same intensity.

angle $\theta$, at point $C$. If the shock ended at this point, this would create the impossible situation of a speed $V_2$ at $C$ which would not be parallel to wall $\omega$.

It can therefore be imagined that an oblique shock wave originates from $C$ such that it causes a deviation of the fluid $(-\theta)$ with the opposite sign to the first. This is the " reflection of the incident shock wave ".

With $M_2$ and $\theta$ known, it is possible to determine, as indicated above, the angle of inclination $(\beta_R)$ of the reflected shock wave and Mach $M_3$ provided $\theta$ is less than limit deviation angle $\theta_m$ corresponding to $M_2$ (see *fig. 12*).

*Fig. 14* was drawn for $M_1 = 2$ and $\theta = 7^\circ 48'$. It was found that :

$$\beta_1 = 37^\circ ; \quad M_2 = 1.721 ; \quad \beta_R = 36^\circ 12' ; \quad M_3 = 1.45.$$

When the angle of the corner decreases towards an infinitesimal value $(d\theta)$, the oblique shock wave tends towards a Mach wave with an inclination of $\mu_1$ $(\sin \mu_1 = 1/M_1)$ and the reflected shock wave tends towards a Mach wave with the same inclination $(\beta_1 = \beta_R = \mu_1)$. The Mach wave is reflected from a solid wall according to the same law as a ray of light is reflected from a mirror.

## 7. Surface of thermal or contact discontinuity

When $\theta$ is greater than $\theta_m$ $(M_2)$, the simple reflection just described is no longer possible.

As a rule a configuration with three shock waves or Mach configuration, such as is illustrated in *fig. 15*, occurs. At a point $A$ near the wall, there is a perpendicular shock wave $(N)$ and a reflected oblique wave $(R)$.

Following two fluid particles which describe current lines *(a)* or *(b)*, we note that they undergo different variations in entropy as they cross $(I)$ and $(R)$ or $(N)$ and that speeds $V_3$ and $V_4$ are not equal ($V_3$ is supersonic and $V_4$ subsonic). There must therefore be a surface $AS$ originating from $A$ which separates two flows of different entropies and speeds but with equal static pressures $(p_3 = p_4)$. This surface is known as a thermal or contact discontinuity.

The photographs in *fig. 16* show a Mach configuration obtained during tests on a device using variable supersonic speeds. The three shock waves (the plane wall is above the model, outside the photograph) and the thermal discontinuity are clearly discernible. In this test there was a non-stationary configuration with point $A$ moving away from the wall at high speed (so-called direct Mach configuration). It was only possible to photograph this with a high speed camera (600 pictures a second, individual exposure 1/3000 second) attached to the exit of a Schlieren apparatus responding to variations in the density of the fluid.

Fig. 16 : Variation in a Mach configuration with non-stationary arrangement (Schlieren pictures; 600 frames per second, exposure 1/3000 second) : the plane wall is above the model, outside the photograph; the thermal discontinuity, corresponding to AS in fig. 15, is moving away from the wall at great speed.

It should be noted that other configurations are possible when $\theta$ is greater than $\theta_m$. They show either a centred expansion wave or a dead zone of fluid limited by two thermal discontinuities, etc. [4]

[4] R. Conrant and K.O. Friedrichs. — " Supersonic Flow and Shock Waves ", New York University, 1948.

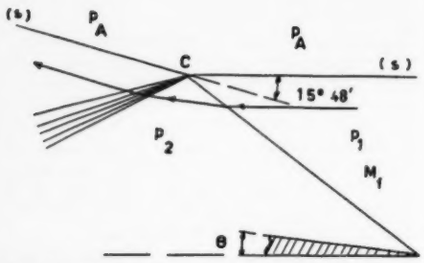



Fig. 18: Reflection of an oblique plane shock wave from a free supersonic jet; the shock wave is reflected as an expansion wave.

## 8. Influence of boundary layers

Practical investigation of the reflection of an oblique shock wave from a plane wall, for the purpose of extending the results of theoretical calculations, is hampered by the boundary layer along the wall. Under the influence of the shock wave and its adverse pressure gradient, the boundary layer tends to break away from the wall and modifies conditions at the limits considered in the theoretical calculations.

To avoid this inconvenience it suffices to examine the interaction of two oblique shock waves of the same intensity $(I_1$ and $I_2)$ inside the flow ; *fig. 17*. Under conditions of simple reflection, these shock waves will continue along $R_1$ and $R_2$, and $AB$ will be a current line because of symmetry. Phenomena will thus be the same as if $I_1$ and $I_2$ were reflected along $R_2$ and $R_1$ from a solid wall at $AB$ without boundary layer.

## 9. Reflection of an oblique shock wave from the free surface of a supersonic jet

Let us now consider a supersonic flow limited by air at rest (case of a free supersonic jet) and study the behaviour of an oblique plane shock wave at its point of impact C with the free plane surface *(s) (fig. 18)*. If the wave terminated at $C$, we should have the impossible situation :

$$p_A = p_1 < p_2 = p_A$$

the static pressure in the flow being necessarily equal to pressure $p_A$ in the fluid at rest.

It must therefore be concluded that static pressure decreases until $p_1 = p_A$. This can only be so for an expansion wave centred at C.

A shock wave is therefore reflected as an expansion wave on the free surface of the jet.

*Fig. 18* was drawn for $M_1 = 2$ and $\theta = 7^\circ 48'$. The sudden deviation at point $C$ of the free surface of flow is discernible.

If we imagine that the surface limiting the supersonic jet is formed of suitably arranged solid particles and free particles, it is possible to conceive that there might be no reflection of the incident wave. The application of this principle would make it possible to prevent the shock waves originating from models in the test section of supersonic wind tunnels from reflecting from the tunnel walls and returning to the models, such as happens above all in tests in the transonic range.

# Book Reviews

*Der Ultraschall und seine Anwendung in Wissenschaft und Technik* — 6th Edition. By Dr. Ludwig Bergmann, Honorary Professor of Physics at the Justus Liebig College, Giessen. S. Hirzel Verlag, Zurich, 1954. (German ; 1,114 pages ; price Fr. 72).

As the earlier editions of this standard work have not been reviewed in *Interavia*, it is fitting that somewhat fuller attention be given now to the 6th (revised and enlarged) edition, particularly as supersonics has greatly expanded its field of application and is gaining greater and greater importance in modern engineering and medicine. " Supersonics " are the sound frequencies above the audible limit of the human ear, i.e., sound oscillations of approx. 20 kc/s to 1,000 mc/s, which have a wavelength of 1.6 cm to 3/10,000 mm in air, 6 cm to 12/10,000 mm in fluids and 20 cm to 40/10,000 mm in solids. Such inaudible sound waves have been used for centuries by bats to find their way in the dark, since long before airmen created DME and airborne radar for the same purpose and seamen used supersonic waves for echo sounding. Today supersonics play an outstanding role in the aircraft industry : production of lubricants ; removal of gases from hydraulic fluids ; testing work pieces, etc. In wind tunnels and on the jet pipes of turbojet engines—where vanes frequently are not indicated because they would spoil the flow or because of high temperatures—distribution of flow and gas speed can be ascertained easily and accurately by the supersonic method.

The present new edition of this truly comprehensive text-book has had to be expanded by about one third to cover the mass of research results and publications of the post-war years. The number of illustrations has risen from 460 to 609, of tables from 83 to 117. An introduction is included explaining the physical bases, and the sections on magnetostrictive and piezo-electric sound producers have been enlarged and considerable additions made to the chapter on " Applications." The bibliography covers 120 closely printed pages and lists no fewer than 5,162 titles (!) covering all relevant literature down to patent specifications. Detailed index of names and subjects. Al.

*Development of the Guided Missile* (2nd Edition). —By Kenneth W. Gatland.—Published for " Flight " by Iliffe & Sons Ltd., London, 1954 (English ; 292 pages ; price 15 shillings).

The second edition of this introduction to guided missile techniques, first reviewed in these pages two years ago (*Interavia* No. 9, 1952), has been expanded to 292 pages, with over 100 illustrations. The author has covered, in condensed form, everything of value in this vast field, including many of the latest developments. Four new sections have been added : propulsion, research and development, post-war work on guided bombs and problems of the long-range missile. The latter chapter also mentions probable Russian work. The reader is initiated into the most varied questions—e.g., fully automatic star tracking for long-range rockets, determination of optimum weight ratios for multi-step rockets etc.—without being burdened with obscure details. A new appendix (I) gives interesting details of telemetering systems such as are used in British guided missiles. The table of guided weapons and rockets of all kinds (Appendix III) has been enlarged to cover 140 different types from eight countries and brought as far up to date as security regulations permit. Theoretical details are valuably supplemented by drawings of more than 40 of the rockets listed in the table (Appendix II). The bibliography, also revised and enlarged, lists books, magazines and documentary films covering the whole field of rocket engineering. Re.

*Junge, das ist Tempo, Flugzeuge von heute und morgen—und ihre Piloten.* By Hans J. Pirner. Franz Schneider Verlag, Munich, 1954 (German ; 64 pages ; price DM 3.90).

*Junge, das ist Tempo, Mit der Rakete zur Weltraum-Station.* By Werner Büdeler.—Franz Schneider Verlag, Munich, 1954 (German, 64 pages ; price DM 3.90).

As its overall title—Junge, das ist Tempo (Boys, that's Speed)—reveals, this series of books is written for young readers, who want to know about present and future technical developments at an early age. Obviously, such a circle of readers cannot be loaded with specialized knowledge which is properly the domain of the engineer. However, the publishers and their authors have succeeded, through a happy combination of text and excellent photographs and drawings, in introducing their readers to certain branches of engineering.—For example, " Flugzeuge von heute und morgen—und ihre Piloten " (Aircraft of today and tomorrow—and their pilots) gives a small cross-section of modern aviation in five episodes, from which even delta wings and vertical risers are not absent. The second book, " Mit der Rakete zur Weltraumstation " (By rocket to the earth satellite vehicle) explains how a rocket works and gives a glimpse of projects which may perhaps become realities within a few decades. Two other books, on cars and motor cycles, are shortly to appear in the same series. Re.

*Taschenbuch der Luftfahrt 1954*—By George W. Feuchter.—J.F. Lehmanns, Munich, 1954 (German ; 216 pages with 318 photos : price DM 20 paper back, DM 22.50 bound).

In bringing out this handy pocket size 1954 edition of the well-known prewar " Handbuch der Luftfahrt " (the German counterpart to " Jane's " and originally in large format), the publishing firm of J.F. Lehmanns has resumed an old tradition. The new reference book on aircraft and engines uses the latest officially released information and gives a comprehensive picture of present-day civil and military aviation. Technical characteristics and data of most aircraft and helicopters, and the most important piston engines, gas turbines, ramjets and rockets are listed in condensed form and supplemented by 318 photos and drawings. An interesting point is that the information given on Russian aircraft is in some cases more detailed than could be expected from the authentic material hitherto available. The book also contains : exact name and address of the makers of all the aircraft and engines described ; international markings for civil aircraft ; nationality markings for military aircraft ; list of type designations of civil and military aircraft of the major air powers. Ri.

*La Grande Conquête.* By Willy Coppens de Houthulst. Gérard & Cie., Verviers, Belgium (French ; price : 15 Belgian francs, 120 French francs, 2.25 Swiss francs).

The author, well-known Belgian air ace of World War I (36 victories), has written this little book for young readers, to describe for them the origins of the conquest of the air. The epic unfolds from the Montgolfier Brothers up to Blériot, with lively accounts of the contribution of each pioneer, details of which are frequently taken from sources contemporary with the events described. Young readers will draw from this book a lesson of energy, perseverance and courage. La.

*L'aviation des temps modernes.* By Edmond Blanc. —Librairie Larousse, Paris, 1953 (French, 560 pages).

The editor of *Interavia*'s French edition has been using this work daily for many months without realising that it was of such recent publication. Having now discovered this fact, he feels it is high time the book was presented to *Interavia*'s readers. Everyone interested in aviation should have this book, which presents in easily digestible form a summary of all technical aspects of modern aviation. There is no other similar work in France and perhaps not elsewhere. La.

**To be reviewed in the next issue :**

*Axialkompressoren und Radialkompressoren, Anwendung, Theorie, Berechnung.* By Dr.-Ing. B. Eckert, assisted by Ing. E. Schnell.—Springer-Verlag, Berlin-Göttingen-Heidelberg, 1953 (German ; 439 pages with 426 illustrations and 6 tables ; price DM 73.50).

# The Comet Accident Inquiry

The Court of Inquiry into the accidents in 1953-54 involving the loss of a number of D.H. *Comet* jet airliners opened in London on October 19th, 1954 under the chairmanship of Lord Cohen. The report read by Sir Lionel Heald, Q.C. reveals that the main cause of the *Comet 1* crash near Elba in January 1954 was rupture of the fuselage at an altitude of about 30,000 ft. The investigating group of the Royal Aircraft Establishment at Farnborough puts this rupture down to metal fatigue.

Describing the technical details Sir Lionel said that the sequence of events had been assumed to be the following: first a fatigue rupture underneath a small window near the ADF aerial ; then various secondary ruptures along the cabin windows (particularly at the corners of the rectangular windows) ; finally a general disintegration of the fuselage ; separation of the tail unit and the pilot's cockpit from the fuselage ; outbreak of fire in the wing. — The occupants were presumably hurled out of the aircraft, with their seats, immediately the cabin roof failed. Although evidence from the crash of another *Comet* south of Naples is lacking, this accident also probably took place in the same manner.

Sir Lionel pointed out that the Court's task was basically restricted to publishing findings, but it might prove advisable to recommend the Air Registration Board to revise its requirements for this type of aircraft.

# *The Mind of Mr. Reader...*

### Against the N.A.T.O. issues...

As a regular reader of your Review — through the good offices of my employers Air France— I regret to tell you that your last issue (No. 8, 1954) deeply shocked me. We all know that the world is not perfect, and that this poor world is more and more divided. But after all it does not seem desirable for a magazine such as *Interavia* lightheartedly to throw oil upon the flames and sow panic among men.

The only really international aviation magazine, with a world-wide audience, *Interavia* should not allow articles such as those signed by Major General Montgomery of the U.S.A.F. or Captain Macmillan to appear in its pages. It is ridiculous for an Englishman to talk about stopping up the Straits of Gibraltar, the Dardanelles and the Skagerak all at once, when in the midst of the war—in 1942 if my memory does not fail me—the *Prinz Eugen* and two or three other German ships managed to slip through the Straits of Dover without a scratch. At that time one could not claim the effect of surprise as an excuse...

I hope that this issue of your Review will not be repeated, and that forthcoming issues will return to your normal practice of serving peaceful international aviation in the service of the whole world.

Lyons — M. BARTHE.

**In the Editors' view, an international aviation magazine cannot ignore questions of air politics, service aviation and or even atomic warfare, if it wishes to keep its readers properly informed. Needless to say, *Interavia* has not the slightest desire to create panic or to "throw oil on the flames." The article by Major General J. B. Montgomery, to which Monsieur Barthe takes exception, is a purely objective account of the organization and tasks of the U.S. Air Force's Strategic Air Command. Even the most critical reader could not have got the impression that Major General Montgomery is a "war-monger". — As for the article by Captain Macmillan, the Editors stated in their introduction that it contained certain suggestions, particularly involving international law, with which they were not in full agreement. But this was not sufficient reason to withold publication of such an informative contribution.**

### ...and for the N.A.T.O. issues

I found the two special N.A.T.O. issues of *Interavia* very interesting ; they gave me a complete picture of military aviation in Western Europe... However, the counterpart to these issues is missing, namely a detailed account of military and civil aviation in the Eastern *bloc*. You will perhaps reply that you have too little detailed and accurate material for such an issue ; but I suggest that you head the issue " Not guaranteed". Most of your readers would understand. When will *Interavia* give us this issue ?

Stuttgart — Wolfgang ZELL.

***Interavia* would be very pleased to produce a Russian issue, but unfortunately the supply of material is a matter of high-level politics. The Editors do not feel attracted to espionage and speculation... or to information for which they can accept no responsibility.**

### A Bernese supporter of the Comet

... the remarks on the *Comet* jet airliner interwoven in the September issue of *Interavia* (No. 9, 1954) seem to me to be not entirely justified. May I, as a layman, take this opportunity of putting forward the following ideas on this subject :

... We must not forget that this misfortune might have happened to any other aircraft manufacturer... Even some of the piston-engined types now set up as safe, fully-developed aircraft against the *Comet* at first suffered far more accidents—some of them also followed by grounding—until careful investigation showed what structural modifications were needed. If the *Comet* goes back into service when the cause of the accidents has been cleared up and perhaps structural alterations made, and gains the public's confidence, as these other types have done, I am convinced that it ... will still become a resounding success... It should not be forgotten that passengers choose their aircraft (and often thus their airline)—where safety, speed and comfort are equal—by its external appearance... Where beauty of line is concerned, which made its first real appearance in the DC-2 and which today gives the DC-7 and the *Super Constellation* their elegance, the *Comet* has reached real perfection...

Berne — Hans BÄNI.

**On careful reading of the September issue, the Editors can find no reference —justified or unjustified—to the design or to supposed structural faults in the *Comet*.—However, it was not possible to avoid remarking that the grounding of the *Comet* has been a blow to British air transport and to the whole British aircraft industry.**

**A verdict on the cause of the accidents will be pronounced by the official Court of Inquiry which opens in London on October 19th (after these lines have gone to print) under the chairmanship of Lord Cohen, Lord of Appeal. As the Court is composed of leading personalities from British and foreign aviation authorities and industry, it can be expected to uncover the true causes, as far as this is humanly possible. (cf. p. 777 : The Comet Accident Inquiry.)**

# *Interavia in the United States . . .*

*Interavia* has pleasure in announcing a further extension of its organization.

**Scholer Bangs, of Los Angeles,** who has been a free-lance contributor to *Interavia* for the past eight years and whose articles have been highly appreciated by readers, became *General Manager and Editorial Director for the United States* on October 15th. He will direct all American interests and control the new *Head office*, whose address is:

INTERAVIA U.S.A.
123 NORTH GLADYS AVENUE
MONTEREY PARK, CALIF.

The *New York branch office*—Interavia, 185 Madison Avenue, New York 16—will be retained and will also be under Mr. Scholer Bangs' management.

Scholer Bangs needs no introduction to American aviation circles. Born on June 12th, 1905 in the State of Kansas, he early became interested in flying and was already well known as an aviation writer before the war. For a number of years he worked for the McGraw-Hill organization and "Aviation Week ", and later became aviation writer and public relations man for the Hearst Press. His talent will now enrich *Interavia*'s reporting on the United States.

# *. . . and Germany*

October 15th also saw a change in *Interavia*'s representative in Germany, where **Colonel Wolf Eberhard** has taken over management of Interavia Verlag G.m.b.H. The German office has also been transferred from Düsseldorf-Lohausen to

FRIEDRICH-EBERT-STRASSE 1
FRANKFURT A.M.

Born at Ulm (Danube) on March 4th, 1908, Eberhard joined the aircraft industry in 1926 and obtained his pilot's certificate the same year. In 1927 he joined an artillery regiment in the Reichswehr of those days and in 1934 was transferred to what later became the Luftwaffe, becoming squadron officer in reconnaissance units and from 1936 adjutant at the Reich War Ministry and the Supreme Wehrmacht Command. At the outbreak of war he was squadron captain of a reconnaissance squadron, was seriously wounded (loss of left leg) and in July 1940 became Staff Officer to the commander of the Army air units. Later appointments included Staff Officer to the Air Ordnance General and Inspector General of the Luftwaffe, and from September 1944 Chief of Staff to Air Fleet 10.

After the war he held a number of positions in industry and joined the Blank Office (future defence ministry) under the Federal Chancellery in May 1952. He resigned voluntarily from this position in April 1954.

Colonel Eberhard enjoys high esteem in all German aviation circles and has close connections with industry. *Interavia* therefore feels convinced that it has found in him the best man to take care of its German interests.

INTERAVIA
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# Even crows walk when it's foggy ...

They can't see enough to fly in a " pea soup ". In the same way the pilot is " lost " in a thick QGO fog. But these conditions do not often arise, as good lighting enables the pilot to pick out the runway by its lamps . . . valuable landmarks which help him to come down without mishap. Proper lighting is essential to the safety of flying. Backed by years of specialised experience, ADB Air Equipment's engineers design and build lighting systems of maximum reliability and maximum efficiency.

ADB's latest achievement : the equipment of a new instrument landing runway at Brussels National Airport.

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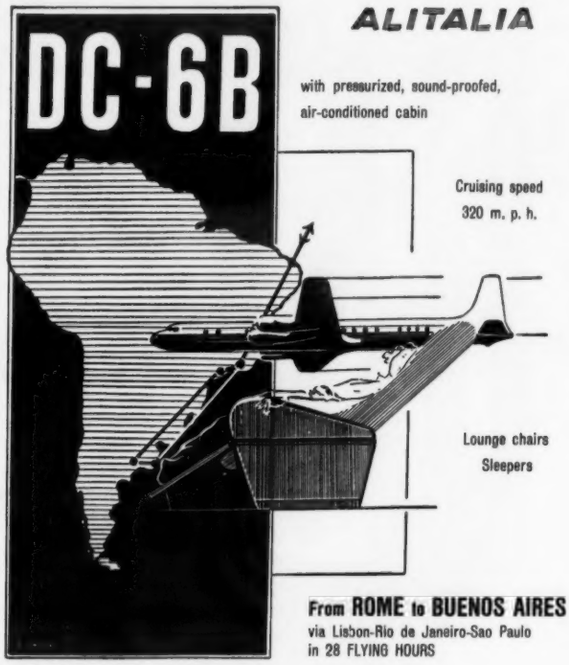

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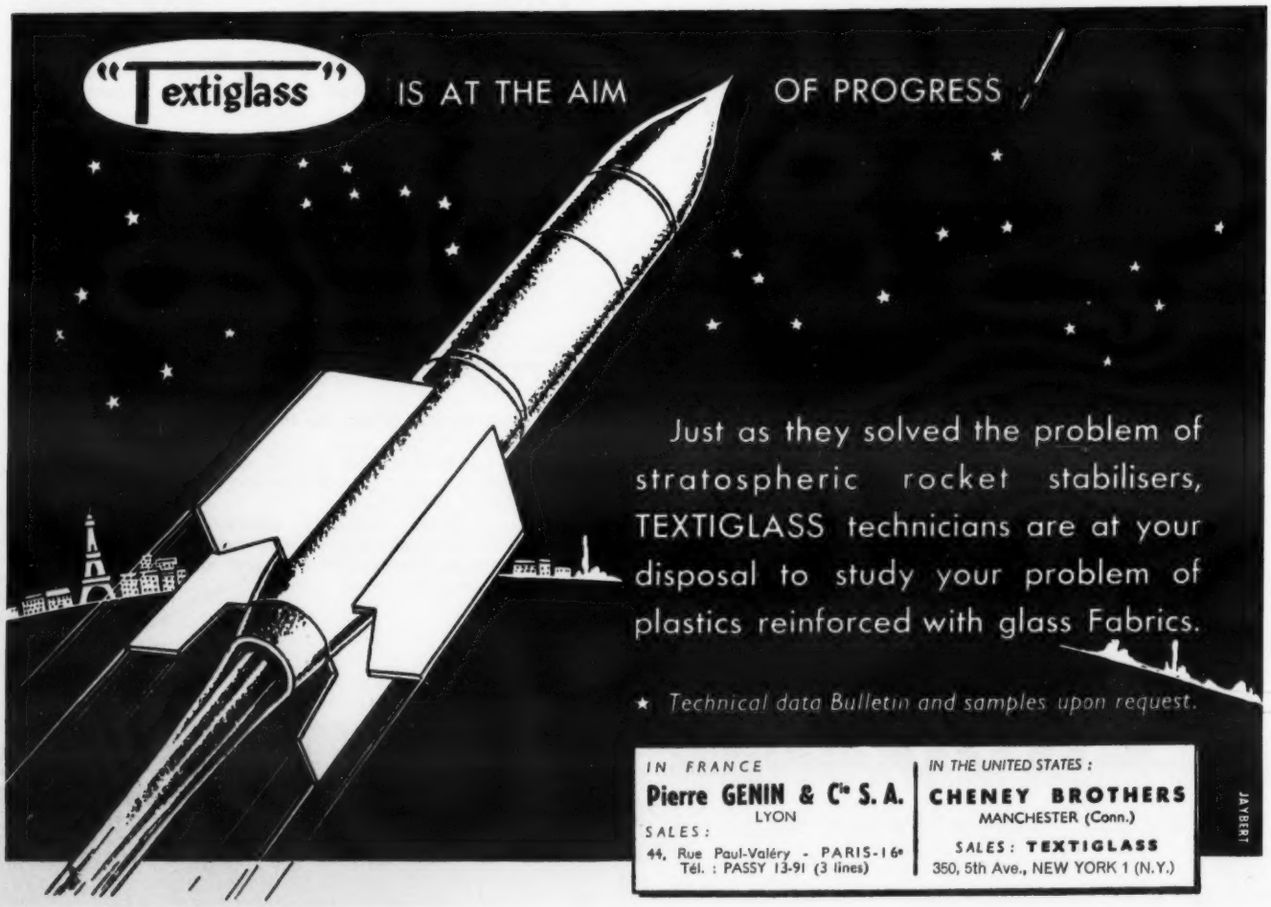

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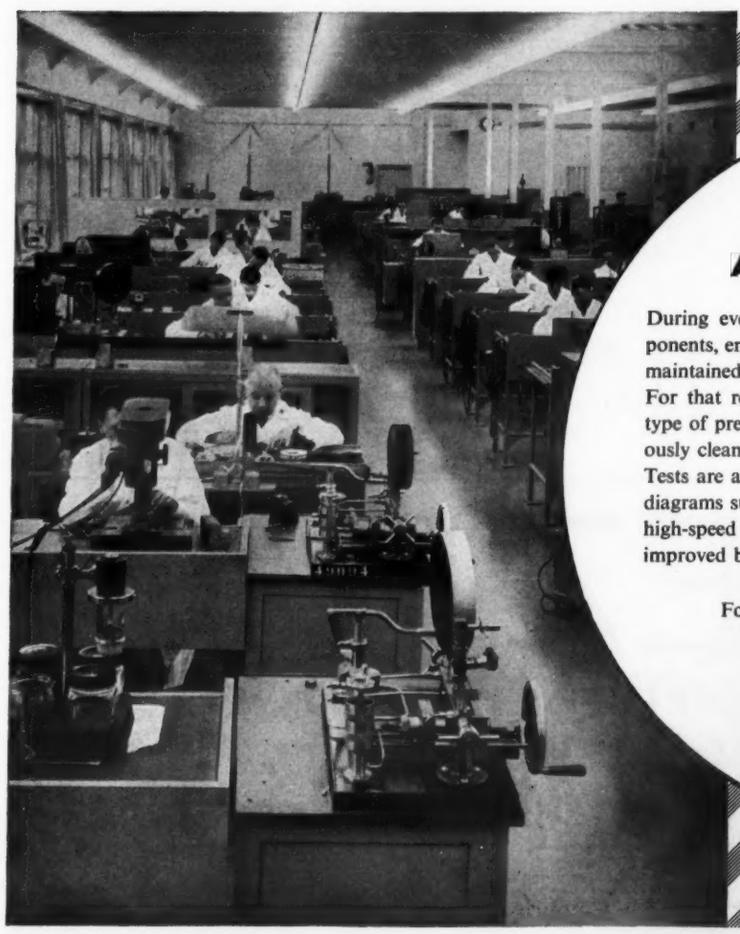

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